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# Occupational Therapy Interventions for Pre and Post Liver Transplant Patients

Tina M. Sauber  
*University of North Dakota*

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OCCUPATIONAL THERAPY INTERVENTIONS FOR PRE AND POST LIVER  
TRANSPLANT PATIENTS

By

Tina M. Sauber, OTR/L

Advisor: Janet Jedlicka Ph.D., OTR/L

A Scholarly Project

Submitted to the Occupational Therapy Department

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master's of Occupational Therapy

Grand Forks, North Dakota

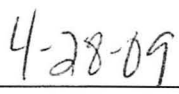
May 10, 2008





This Scholarly Project Paper, submitted by Tina M. Sauber in partial fulfillment of the requirement for the Degree of Master's of Occupational therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

  
\_\_\_\_\_  
Faculty Advisor

  
\_\_\_\_\_  
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## ABSTRACT

Liver transplantation is the only treatment of choice for chronic liver disease. The illness distress associated with liver disease and transplantation involves every aspect of the individual's life (physical, psychological, social and spiritual) and impacts the individual's quality of life, an important outcome measure of life satisfaction and well-being (Belle, Hoofnagle, Lake, Porayko & Zatterman, 1997). Patients on the liver transplant waiting list experience a decline in functional performance or may expire while waiting.

The occupational therapist has the challenge of motivating the patient to independently manage his or her life and will complete a comprehensive evaluation with emphasis on the social, emotional, and physiological effects following liver transplantation. Occupational therapy intervention for those awaiting liver transplantation aids in assisting and providing a safe environment for the person living with the progressive disease process, facilitates the strength and endurance necessary to undergo such a complex surgery as well as promotes improved functional outcomes post surgery (Hasting, Gowans, & Watson, 2004).

Reviewing the current professional literature and research was a key element in accomplishing the goal of identifying an evidence-based method to incorporate occupational therapy interventions into the lives of those with end-stage liver disease. A comprehensive literature review revealed the complicated process of liver disease and post liver transplant recovery. Based on the literature review, a comprehensive education program was developed

for patients with end-stage liver disease and their families. The program consists of five sessions addressing detailed information and education to the families/caregivers regarding the disease progression. It provides a glimpse into post surgical activity guidelines following liver transplantation.

Each session consists of a group activity, time to review previous information and answer questions before beginning new content. Included in the project are extensive notes and activities for the occupational therapist that is implementing the sessions. The goal of these sessions is to provide participants with information and resources to maintain a healthy status while awaiting transplantation and post surgery.

## CHAPTER I

### INTRODUCTION

End-stage liver disease presents itself with varying disease complexities that can limit one person's ability to function independently while another person experiences the same disease process can learn to adapt. Occupational therapy intervention both pre and post-liver transplant can help people regain, develop, and build skills that are important for independent functioning, health, well-being, security and happiness (American Occupational Therapy Association, 2007). Occupational therapy intervention for those awaiting liver transplantation aides in assisting and providing a safe environment for the person living with the progressive disease process, facilitates the strength and endurance necessary to under-go such a complex surgery as well as promotes improved functional outcomes post surgery (Hasting, Gowans, & Watson, 2004).

Liver transplantation is the only treatment of choice for chronic liver disease. The illness distress associated with liver disease and transplantation involves every aspect of the individual's life (physical, psychological, social and spiritual) and impacts the individual's quality of life, an important outcome measure of life satisfaction and well-being (Belle, Hoofnagle, Lake, Porayko & Zatterman, 1997). Patients on the liver transplant waiting list experience a decline in functional performance or may expire while waiting (Fink et al., 2006).



The occupational therapist has the challenge of motivating the patient to independently manage his or her life and will complete a comprehensive evaluation with emphasis on the social, emotional, and physiological effects following liver transplantation. The philosophy of occupational therapy fits well into the larger team of healthcare professionals and complements the teams' ability to meet the needs of the whole person.

Based on these findings and the need for patient and caregiver education, the product of this scholarly project is the development of a series of educational teaching sessions that include the patient and those family members or caregivers whom will be involved to the care of the patient both prior to and following liver transplantation. The sessions provide detailed information and education to the families/caregivers regarding the disease progression and encouragement to involve the patient in functional tasks, routine exercises and positioning techniques.

The theoretical model utilized for this scholarly project was the Ecology of Human Performance Model (EHP), which emphasizes the context in which activities occur (Reitz & Scaffa, 2001). The major components identified in this model include: the person and his or her skills, abilities, tasks and performance range. The EHP model outlines five intervention approaches: establish/restore, adapt/modify, alter, prevent and create. Applying the EHP model to the pre and post-liver transplant population is appropriate as it works well to support the objective of the pre-transplant education session and the post-liver transplantation occupational therapy goals to identify potential threats to independence when different skills, abilities, and contextual issues create a mismatch or inability to perform.

The educational sessions will help pre and post-surgical liver transplant patients and guide families/caregivers to assist the person with achieving the highest level of function possible during the disease progression in all performance areas.

Chapter II of this document is a review of literature and chapter III of this document is a description of the methodology used to develop the comprehensive educational sessions and materials for the class. Chapter IV contains the product in its entirety and chapter V includes a summary and recommendations.

## CHAPTER II

### A REVIEW OF THE LITERATURE

Liver transplantation has become a frequently used treatment for acute liver failure and end-stage liver disease and often the only option to those with hepatic dysfunction. Liver transplantation is initiated only when the patient has irreversible end-stage liver disease that is refractory to other forms of conventional therapy. Examples of indications for liver transplant include advanced chronic liver disease, fulminate hepatic failure, and metabolic liver disease (Larson & Curtis, 2006; Van Thiel, Makowka & Starzl, 1988). Acute liver failure occurs rapidly (in as little as 48 hours) and can be difficult to detect versus end stage liver disease, which is a long-term, and progressive. Both variants of liver disease cause impairment in liver function, known as hepatic dysfunction. Liver transplantation can offer patients an opportunity for complete recovery and long-term survival (Khin-Heung Chong, 1994). The number of patients awaiting transplantation far surpasses the donor supply, resulting in lengthy waiting times. This literature review covers the complicated process of liver disease and post liver transplant recovery. In addition it discusses the role of occupational therapy intervention for the liver diseased patient population.

The Organ Procurement and Transplantation Network [OPTN], reports the liver is one of the largest and most complex organs in the body and weighs about three to five pounds (2008). It has numerous functions that are necessary for life. It helps process carbohydrates, fats and proteins, and stores vitamins. The liver processes nutrients absorbed

from food in the intestines and turn them into materials that the body needs for life. There are over 16, 715 people on the waiting list for a liver transplant (OPTN, 2008).

Cirrhosis, scarring in the liver, is the most common reason for liver transplants in adults. It occurs when scar tissue replaces healthy cells and prevents normal liver function. Conditions that may cause cirrhosis and the need for a liver transplant include: Chronic hepatitis B and C, diseases of the bile ducts, alcoholic liver disease, autoimmune liver diseases and buildup of fat in the liver (Runyon, 2004).

According to D. Mulligan, M.D. FACS, persons with end-stage liver disease often suffer from generalized weakness, fatigue, mental status changes and the reduced ability to perform activities of daily living (personal communication, May 29, 2002). Patients on the liver transplant waiting list experience a decline in functional performance or may expire while waiting (Fink et al., 2006). The longer waiting times for transplantation place patients at higher risk as the disease progresses. According to Vintro, Krasnoff, and Painter (2002), malnutrition, low body mass index, muscle loss, poor diet/nutrition and inactivity increase morbidity and mortality in the pre-transplant population. Poor nutrition contributes to many of the problems of liver disease, including cachexia and osteoporosis. Cachexia, known as physical wasting with loss of weight and muscle mass, associated with liver failure is the result of metabolic alterations, anorexia, malabsorption and decreased physical activity. It is important that efforts be taken for this population to undergo dietary counseling and physical activity conditioning programs. It is highly probable that poor diet and physical inactivity exacerbate the metabolic and functional abnormalities such as muscle wasting, decreased formation of plasma proteins, abnormal amino acid restructuring, malnutrition, osteoporosis and inactivity are associated with the disease itself (Vintro et al., 2002).

Occupational therapists have unique training and experience in handling mental and physical impairments of those with medically compromising diseases. They help people regain, develop, and build skills that are important for independent functioning, health, well-being, security and happiness (American Occupational Therapy Association, [AOTA], 2007). Occupational therapy intervention for those awaiting liver transplantation aides in assisting and providing a safe environment for the person living with the progressive disease process, facilitates the strength and endurance necessary to under-go such a complex surgery as well as promotes improved functional outcomes post surgery (Hasting, Gowans, & Watson, 2004).

D. Mulligan, M.D. FACS, reports, postoperatively, patients present with the increased risk for deep vein thrombosis, ileus, skin breakdown as well as a decline in the physical and mental capabilities, which affects the ability to return to and enhanced quality of life. He also indicated that early occupational therapy interventions are essential to the recovery of the liver transplant patient population (D. Mulligan, personal communication, May 29, 2002).

Early interventions at both the pre and postoperative stages optimize patient success. Vintro et al. (2002) report nutritional effects of osteoporosis, weight gain and muscle loss after transplant should be addressed as routine post surgical care. Hasse et al. (1997) recommend that liver transplant candidates should be encouraged to consume foods high in calcium and vitamin D and have dietary consults to assist with the identification of foods that increase malabsorbtion. Immediately post transplantation, diet recommendations include the ingestion of high protein, high calorie diets to counteract the weight loss associated with pre-transplant cachexia and increased energy requirements for surgical recovery. Following the acute post-operative stage, it is imperative that patients have dietary consults to assist in the

transition from high caloric diets to a diet that promotes physical markers conducive to longevity including low in fat, high in fiber and bone building specific nutrients. Diet and exercise will potentially reduce the cardiovascular risk, excessive weight gain, osteoporosis and muscle wasting after transplantation and optimize overall health and well being in this patient population (Hasse et al., 1997).

A study conducted by Burke (2003) indicated the 10-year survival rate after liver transplantations is approximately 65%. With the increase in number of long term liver transplant survivors has come an appreciation of some the health problems that this patient population has to face. The main causes of death in liver transplant recipients include graft failure, cardiovascular disease, and infection. This patient population also has increased prevalence on many chronic conditions such as hypertension, hypercholesterolemia, diabetes mellitus, renal impairments and osteoporosis related compression fractures that have a significant impact on quality of life. Many of the adverse health effects seen in this population are direct or indirect consequences of immunosuppression. Burke (2003) goes on to state that infections after recovery from liver transplantation accounts for 15%-20% of deaths in post transplant survivors. Bass, Bindon-Perler and Lewis (1991) indicate, “the recovery process following liver transplantation is a life long process” (p. 61). While Khin-Heung Chong (1994) reports there may be controversy over the justification of rehabilitation interventions with the end-stage liver diseased population, his findings indicated that effective intervention in this patient population can minimize the deterioration of function, maintain acquired abilities, maximize independence and sustain the process of healthy adjustment despite the presence of a chronic condition.

The World Health Organization [WHO], (2008), defines osteoporosis as reduced bone mass/density to less than 2.5 standard deviations below normal (a T-score or less than – 2.5 indicates osteoporosis), a milder degree of reduced bone density is called osteopenia, which is defined at a T-score of 01.0 to –2.5. Hay and Guichelaar (2005) reported that osteoporosis is a well-recognized complication of chronic liver disease and the most fracturing in liver patients occurs after liver transplantation, however pre-transplant osteoporosis is the main risk factor for post-transplant fracturing. Atraumatic vertebral fractures have been reported in up to 30% of liver transplant recipients within the first 6 months of transplant (Burke, 2003).

#### Model of End Stage Liver Disease

The Mayo End Stage Liver Disease Score [MELD] was developed by Kim, Kamath, and Malinchoc at Mayo Clinic Rochester in an effort to allocate cadaver livers for transplantation in the United States based on the severity of illness versus time on the waiting list (Malinchoc et al., 2000). In November of 2001 when the Board of Directors of the United Network of Organ Sharing (UNOS) and The OPTN approved it at a national level the name was changed to The Model of End-Stage Liver Disease. The MELD officially went into effect in February of 2002. According to Malinchoc et al. (2000) the MELD is a numerical scale, ranging from 6 (less ill) to 40 (gravely ill), used for liver transplant candidates' age 12 and older. It gives each person a score based on how urgently he or she needs a liver transplant within the next three months. The number is calculated by a formula using three routine lab test results: bilirubin, which measures how effectively the liver

excretes bile; INR (prothrombin time), which measures the liver's ability to make blood clotting factors; and creatinine, which measures kidney function. Impaired kidney function is often times associated with severe liver disease. The objective of the MELD system is to transplant the patients with the highest likelihood of dying without receiving a transplant.

A study conducted by Bambha et al., (2004) addressed refining the current MELD system by looking at serial MELD scores in patients to predict survival rates among those listed for liver transplantation. The conclusion demonstrates that overall, the current MELD score is the most significant parameter predictive of mortality on the liver transplantation waiting list.

The MELD scores are based on a patient's risk of dying while waiting for a liver transplant, and are based on objective and verifiable medical data (UNOS, 2008). Through extensive literature review, it is noted that the MELD system has demonstrated a significant reduction in wait-list mortality among both adult and pediatric patients with end-stage liver disease.

### Key Factors

Literature reveals that persons with end-stage liver disease experience a progressive disease-related decompensation in functional performance and cognition and suffer from complex medical complications and osteoporosis. This section describes Khin-Heung Chong's enabling factors associated with functional performance, expected changes in cognition and the impact of osteoporosis in persons with end-stage liver disease (1994).



Khin-Heung Chong, (1994) identified three enabling factors associated with functional performance in persons with end-stage liver disease that poses distressing effects for both pre-transplant and post-transplant patients. These factors include deconditioning, self-care and locomotion. Each factor was further divided into more specific areas. Deconditioning is divided into strength and endurance. Self-care includes ability to complete daily self-care tasks and necessary durable medical equipment or adaptive equipment to promote independence with activities of daily living skills. The key areas of locomotion/functional mobility include transfers and ambulation.

### *Deconditioning*

Declines in strength and endurance occur with both the pre and post-transplant populations as the result of the complexity of medical complications that may accompany liver disease. Vintro et al. (2002) report that the pre-transplant adverse effects of inactivity and bed rest may not only worsen the complications of reduced physical functioning, cachexia/muscle wasting and osteopenia, but may also be linked to post-transplant success. They also continue to report that as symptoms of chronic disease manifest, there is a progressive decrease in physical activity, thus causing a spiral of deconditioning. Upper extremity and lower extremity exercises can be useful in building muscle mass and increasing activity levels, they can be modified to fit the active abilities of the patient in lying, sitting or standing. An effort to maintain some level of physical activity while waiting for transplantation is recommended. Beyer et al. (1999) reported that patients with end stage liver disease have reduced exercise capacity at an estimation of 54% of age-predicted levels

and muscle strength in end stage liver diseased patients waiting for transplantation was found to be 30% of age-predicted levels.

Woo et al. (2006) set out to determine whether energy conservation techniques during common activity of daily living tasks actually result in lower energy expenditure. Three common activities of daily living (ADL) tasks that were selected are shopping, hand washing and hanging laundry. Each task was undertaken in an energy-saving way and in a normal way and the three concepts of energy conservation techniques utilized were the use of labor-saving equipment or techniques, organization of workspace and avoidance of overhead reaching. The conclusion of this study indicated measurable benefits were observed with use of labor-saving equipment and avoidance of overhead reaching in younger subjects only. Further detailed studies into current energy conservation techniques for patients with chronic diseases are indicated.

### *Self-care*

The inability to perform basic self-care tasks can be the result of poor nutrition, impaired cognition and debilitation due to disease progression. Occupational therapy interventions facilitate individuals and caregivers to achieve the optimum level of independence in activities of daily living skills. A study conducted by Hasting et al. (2004), evaluated changes in physical function of 23 individuals with an organ transplant who received two or more hours of occupational therapy intervention and physiotherapy while inpatient in an acute care facility. The study specifically evaluated the relationship between individuals' function on their occupational therapy assessment and initial occupational therapy treatment intensity. The change in their function from occupational therapy

assessment discharge and the relative contribution of occupational therapy and physiotherapy to changes in functional status was described. Functional status was evaluated at the time of occupational therapy assessment and discharge using the Functional Independence Measure (FIM). The results of this study provides novel, preliminary evidence supporting effectiveness of occupational therapy, in the presence of physiotherapy, to improve the function of individuals with a history of organ transplantation. No literature was found on the effects of occupational therapy in isolation. Future studies should attempt to replicate and expand on these findings in a larger sample of individuals with a solid organ transplant and explore the efficiency of occupational therapy consultations in this same population.

The use of durable medical equipment and adaptive equipment may be recommended as part of the occupational therapy intervention to promote independence with activities of daily living skills. Common equipment utilized and recommended for this patient population by an occupational therapist includes, but not limited to, a shower chair, to facilitate safety, conservation of energy and independence with bathing, a reacher or sock aide, to promote independence with reaching for items both high and low and dressing tasks, a toilet safety frame and or bedside commode, to promote safety and independence with toileting tasks and the medically complex patient may benefit from the use of a hospital bed and or wheelchair for mobility and safety both pre and post transplantation (Woo et al., 2006). There was no literature found to support the need for durable medical equipment or adaptive equipment following organ transplantation, therefore future studies should occur.

## *Locomotion*

Mobility is an integral part of an individual's normal life. Gelling (1998), reports that without an acceptable degree of mobility, an individual is unable to fulfill roles within his/her life. These roles may include work, household tasks, sports or recreational activities. The debilitating nature of liver disease can leave many patients with a significantly reduced level of mobility.

Palmer (2004) indicates the benefits of exercise gives people a general sense of well-being, gives a person a boost of energy, improves cardiovascular function and results in a reduction of total body fat. Palmer further states that fatigue is probably the most common and one of the most bothersome symptoms that plagues people with liver disease. Many individuals with liver disease frequently feel like they don't have enough energy to make it across the room, let alone around the block. However, the best way to fight this seemingly relentless exhaustion is to exercise. Adding a regular exercise routine such as brisk walking enables the heart and liver to work more efficiently. Over time, this will boost energy levels and as the body gets stronger and more aerobically fit, the cardiovascular system will be able to work more efficiently. While everyone knows that being overweight places a great deal of stress on the heart, most people don't realize that it also makes it harder for the liver to do its job. When total body fat is reduced, fat content in the liver is simultaneously reduced. This often results in a significant reduction of elevated liver enzymes.

## *Cognition*

According to Surman, Dienstag, Cosimi, Chauncey and Russel (1987), patients with liver failure experience levels of hepatic encephalopathy. Hepatic encephalopathy is a result of toxic metabolites not cleared by the failing liver that cross the blood-brain barrier causing mild cognitive and psychomotor deficits in patients with liver cirrhosis therefore, causing a neuropsychiatric syndrome known as minimal hepatic encephalopathy. The intellectual deterioration that follows varies across the course of the condition from slight to gross confusion and is believed by some to include frontal lobe impairment (Davidson & Summerskill, 1956). Surman et al. (1987), report that other clinical manifestations in patients with hepatic dysfunction include lability of affect, atypical emotional responses, depression and anxiety.

Neurological complications are not uncommon in liver transplant recipients. Kim et al. (2007) conducted a study of 319 adult patients who underwent liver transplantation at one medical center. The results revealed that 49 (15.4%) of the 319 patients developed neurological complications. These complications contributed to prolongation of hospital stay, increased in-hospital mortality, and decreased graft and patient survival.

Mechtcheriakov et al. (2004), reported results on a study evaluating changes in neuropsychological tests in 14 liver transplant recipients' pre- and post- liver transplantation. They used a neuropsychological test battery Visuo-Motor and Visuo-Constructive Performance (VMCP): average percentile score of four selected neuropsychological tests) in which overall visuospatial and visuoconstructive performance prior to and after liver transplantation was evaluated. A trend toward improvement in average VMCP score was

demonstrated in post-liver transplant versus pre-liver transplant recipients. However, the tests remained abnormal, compared with a group of healthy volunteers.

Mechtcheriakov et al. (2004), study demonstrates the distribution of the improvement rates within the group of patients and shows that there are two opposite tendencies in the post-liver transplant course of treatment, one toward improvement and one toward deterioration. In the improvement group of seven patients, an increased in VCMP score by 2.52 was concluded as sufficient to be considered as completely reversible, while in the other group the VCMP score deteriorated post-liver transplant. Even though a small number of patients were studied, this finding is important and needs to be further evaluated.

Tarter, Switala, and Van Thiel (1990) first prospectively evaluated neuropsychological function in 62 patients prior to and after liver transplantation. The subjects showed deficits on tasks measuring memory and visuospatial capacity prior to liver transplant compare with normal volunteers. Hillbom, Hockerstedt, Kajaste, Raininko and Seppalainen (1992), report that the majority of neurological impairments disappeared after liver transplantation in eight patients; however four subjects showed new, mild changes in neurophysiological and neuropsychological tests post-liver transplantation, suggesting an operative factor causing minimal hepatic encephalopathy.

Rose and Jalen (2004) reviewed the literature and minimal hepatic encephalopathy may not completely recover with liver transplantation. These authors seriously question the validity of the hypothesis that hepatic encephalopathy is purely a metabolic syndrome. They report that the non-reversibility of hepatic encephalopathy following liver transplantation may result from pre-existing other pathologies, or that hepatic encephalopathy represents a

collection of syndromes in which some are reversible and some are not. The question of whether hepatic encephalopathy is reversible following liver transplantation remains unanswered and therefore sets the stage for a new area of research.

### *Complex Medical Complications*

Liver transplantation has been recognized as an effective means of restoring health in patients who have sustained irreversible liver injury (Starzl, Demetris & Van Thiel, 1989). According to the OPTN, successful outcome of liver transplantation has led to a steady increase in its application, whereas the number of available deceased donor organs has remained essentially stationary, creating a shortage of organs for transplantation. This, in turn, has led to a dramatic increase in the number of patients on the waiting list and in their waiting time. Kim et al. (2006). report that a patient registered for liver transplantation experiences one of three possible outcomes while on the waiting list: transplantation, death or withdrawal from the list. These outcomes are competing risks, because the occurrence of one outcome either precludes or alters the probability of the occurrence of the others.

Numerous physiologic changes and challenges are associated with liver transplantation. Hepatic encephalopathy is present in a large majority of pre-transplant patients (Surman, 1994). Larson and Curtis, (2006), report more than 27,000 patients annually progress to end-stage liver disease and patients with end-stage liver disease experience complications including encephalopathy, malnutrition, muscle wasting, ascites, esophagogastric variceal hemorrhage, spontaneous bacterial peritonitis, fatigue and depression. Such complications may lead to poor candidacy for liver transplantation or removal from the waiting list.

Bass et al. (1991), discuss that complications post-liver transplant exist, such complications include infection, which is the primary threat to graft and patient survival, rejection, which can be viewed as a normal body response and can be treated pharmacologically if timely in nature, acute renal failure, which is normally reversible, hepatic complications from the biliary anastomosis becoming obstructed, vascular fluid complications or hemorrhage which can occur following surgery, psychological complications including steroid psychosis and coping with fear of rejection and, pancreatic complications such as pseudocyst requiring drainage and possible insertion of an external drain.

Bacterial infections are, in fact, a frequent and serious complication of liver transplantation. Most occur during the first 30 days following liver transplantation. The most common sites are the abdomen, bloodstream, lower respiratory tract and the surgical wound. The proportion of patients developing at least one bacterial infection ranges from 25% to 50% and mortality associated with bacterial infections has been 4% to 9% (Arnow, 1995). Patients, both pre and post liver transplantation face a myriad of stressors, including waiting time, surgery, recuperation, complications and changes associated with life style and family dynamics (Bass et al. 1991). Larson and Curtis (2006), discuss that the uncertain outcome in this setting is difficult for patients, families and clinicians.

### *Osteoporosis*

Osteoporosis is a well-recognized complication of chronic liver disease (Hay, 2003). Compston (2003) indicated that the rationale for evaluation and management of osteoporosis is prevention of the clinical morbidity of pain and immobility caused by fracturing. Most



fracturing in liver patients occurs after liver transplantation, but pre-transplant osteoporosis is the main risk factor for post-transplant fracturing; therefore its understanding and subsequent management is important.

According to WHO criteria, osteoporosis is the term used for bone of reduced bone mass or density to less than 2.5 standard deviations below normal adult peak bone mass, adjusted for male or female sex; a T-score of less than  $-2.5$ . A milder degree is called osteopenia, which is a T-score of  $-1.0$  to  $-2.5$  (WHO, 2008).

According to Hay and Guichelaar (2005), several studies of patients who had end-stage liver disease of varying etiologies confirm a high but variable incidence of osteoporosis (11% to 48%) and osteopenia (18% to 35%). They report that despite its incidence, hepatic osteopenia often is overshadowed by more urgent complications of advanced liver disease. Most liver transplant recipients lose bone mass in the first 3 to 6 months after liver transplantation, with a high incidence of post-transplant fracturing in 30%-40% patients with cholestatic liver disease. Patients at high risk of post-transplant complications are those who are osteopenic before liver transplant, especially those with pre-transplant fractures.

Hay and Guichelaar (2005) report that multiple complications of chronic liver disease may cause bone loss: poor nutrition, inadequate calcium intake, vitamin deficiencies, immobility and muscle wasting, hypogonadism, drugs and life style factors (alcoholism, smoking). In osteopenic patients, all reversible factors contributing to bone loss must be corrected. Bone health is maximized with calcium supplementation, adequate vitamin D, good nutrition and exercises program (Hay & Guichelaar, 2005).

A pilot study conducted by Randles, Randolph, Schell and Grant (2004), suggested that occupational therapy interventions was beneficial for clients with osteoporosis.

Occupational therapists offer a personalized educational approach to performing daily occupational activities through activities of daily living skills re-training while incorporating proper body mechanics and posture, training in adaptive equipment to avoid spinal flexion and rotation, increasing strength and endurance through weight bearing activities and decreasing pain through positioning techniques and fall prevention.

Ninkovic et al., (2000) found a high incidence of vertebral fractures in the first three months after liver transplantation and indicate that prevalent vertebral fracture is an important risk factor for the subsequent development of fracture in this patient population. The morbidity attributable to these fractures is considerable, resulting in long-term pain and disability in some patients despite restoration of normal liver function. Ninkovic et al. report that patients with pre-existing fracture are at particularly high risk, emphasizing the need to optimize bone mass in patients with chronic liver disease.

To address the educational needs of osteoporotic patients, Peel, Lein, Kitchin and Morgan (2002), developed a multidisciplinary program involving physical therapy, medicine and nutrition. The purpose of the program is to facilitate changes in diet, movement patterns, balance and physical activity behaviors in people with osteoporosis and for participants to adopt permanent lifestyle changes that will reduce their risk of fracture. The program did reveal short-term changes in strength, flexibility and balance from the initial to the final sessions. The future goal is to determine long-term changes in physical activity patterns and incidence of fracture.

## Quality of Life

Quality of life is an important factor to consider when assessing the value of liver transplantation for surgical candidates during both pre-transplant and post-transplant periods. The WHO defines the quality of life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. Health care providers are concerned with quality of life because it may affect decisions regarding prescribing habits, treatment regimens, and decisions to cease treatment. Studies of quality of life offer greater understanding into the impact of illness and treatment and help health care providers determine whether a given intervention is beneficial in terms of clinical changes, individual perceptions, or economic benefits (Spilker, 1996). Gotardo, Strauss, Teixeira and Machado (2008), found that the Liver Disease Quality of Life, a specific instrument for measuring health-related quality of life, has shown a greater accuracy in relation to liver symptoms and could document impairments before and after liver transplantation.

Occupational therapy has an important role in the assessment, treatment and prevention of disability and handicap in older people (Rogers, 1996). In a study of occupational therapy practice in the field of instrumental activities of daily living, Fricke and Unsworth (1998) found that for the 135 occupational therapists surveyed, use of the telephone, medication management and snack preparation were considered the most important tasks for older people to maintain independence in community living. In addition to independence these occupations, it is also important for occupational therapists to consider their clients' perceptions of what contributes to and is important for quality of life and life satisfaction while living in the community.

Lindberg (1995), in a study of 104 older subjects with subarachnoid hemorrhage, found that inability to socialize and the associated decreased in leisure activities, reduced quality of life. These findings all relate directly to the value of purposeful occupation for a satisfactory quality of life, and the need for occupational therapists to determine in collaboration with their clients which occupations are meaningful to them.

Unfortunately, operational definitions of quality of life in the research literature are often lacking, and when present, suggest a general lack of consensus among researchers (Molzahn, 1991). The lack of a clear definition for quality of life has created doubt, confusion, and misunderstanding among practitioners, researchers, policy makers and patients (Leplege & Hunt, 1997). Quality of life, however, is an important measure of patient response to health-related issues and deserves further investigation despite the challenges of conceptual ambiguity.

### *Pre-Transplant*

According to Diaz-Dominguez, Perez-Bernal, Perez-San-Gregorio and Rodriguez (2006), once the candidate has been informed of inclusion on the waiting list, a series of reactions, and feelings appear that characterize the situation. From this moment on, the patient can be called at any time to undergo a high-risk surgical operation, which leads to a state of uncertainty, fear, dependency and lack of freedom. Younossi et al. (2000), report being on the waiting list for an organ transplant not only produces anxiety and depressive symptoms, but it also limits activities of daily life. Different feelings and reactions will appear during the waiting list period. Many will show normal reactions to the abnormal situation of organ transplantation. Shih, Hu, Ho, Lin and Lee (2000), found that the waiting

list for a transplant produces anxiety symptoms, fear of surgery, emotional problems and alterations in mental health. Diaz-Dominguez et al. (2006) report that providing patients with information about transplantation, about the various phases, and about the side effects of medication as may cause changes in state of mind will help them to overcome negative feelings that emerge during the waiting period.

### *Post-Transplant*

Quality of life is improved after organ transplantation (Younossiet al., 2000). The goal of liver transplantation is not merely to prolong life but also to improve quality of life (Gelling, 1998). Studies have found the intensity of fatigue was reduced after liver transplant; fatigue remained the most distressing symptom one year after surgery (Belle, Porayko, Hoofnagle, Lake, and Zatterman, 1997; Gross et al., 1999).

Burra, De Bona, Canova, Feltrin, Ponton, and Ermani (2000), found that during the first year after liver transplantation, quality of life remains significantly better than before liver transplant, but patients show some problems in social domains and psychological distress. Burra et al. (2000) report these findings may be due to patient's difficulties in adapting to post-transplant conditions, when they have to face both physical problems due to medical complications and the psychological problems of accepting their new bodily integrity, their dependence on drugs and medical staff, and problems in the social and working setting. Bravata and Keefe (2001), indicate that transplant recipients reported large gains in those aspects of quality of life most affected by physical health and smaller improvements in areas affected by psychological functioning and that the recipients' assessments of their own quality of life often reflect their degree of adaptation to post-transplantation life.

The survival of liver transplant patients depends on their understanding of their illness and treatment regimen and compliance with this regimen (Bass et al., 1991), therefore the occupational therapy referral is made. The occupational therapist has the challenge of motivating the patient to independently manage his or her life and will complete a comprehensive evaluation with emphasis on the social, emotional, and physiological effects following liver transplantation.

### Assessments

The following describes two assessments suitable for persons with end stage liver disease. The Quality of Life Index-Liver Transplant has been a commonly used measurement with this patient population to evaluate the impact of end stage liver disease on those affected. The Canadian Occupational Performance Measure can be utilized to provide client-centered outcomes in occupational performance.

#### *Quality of Life Index-Liver Transplant*

Quality of life has become an important outcome measure in recent years for evaluating the value and impact of health care (Ferrans & Powers, 1992). The WHO (1997) defines quality of life as an individual's perception of their position in life in the context of the culture and value system in which they live and in relation to their goals, standards, and concerns.

Quality of life in the end-stage liver disease patient population is measured using the Quality of Life Index (QLI), Liver Transplantation Version (QLI-LT) (Ferrans & Powers, 1985). The QLI was developed to measure the quality of life of both healthy and ill

individuals. The tool, written at a 3rd grade level, consists of 72 questions divided into two equal sections: satisfaction and importance. Each question consists of a six-point Likert-type scale assessing the four domains of quality of life identified within the conceptual framework: health and functioning, social and economic, psychological/spiritual, and family. The satisfaction measure ranges from 1 (very dissatisfied) to 6 (very satisfied) and the importance measure ranges from 1 (very unimportant) to 6 (very important). Total score range is from 0-30. Higher scores represent higher levels of quality of life.

To score the QLI, satisfaction scores are multiplied by importance scores for each item to obtain adjusted item scores (Ferrans & Powers, 1992). This method assures the most important life aspects have the greatest influence on total quality of life scores for each subject. Individual item scores are then summed and divided by the total number of items answered to determine a total quality of life score. The QLI also allows for a quality of life score for each of the four domains. To determine domain scores, only the items within each domain are scored using the method noted above.

The QLI has been used extensively in clinical populations including persons with cancer, cardiac, end stage renal disease, HIV/AIDS, chronic fatigue syndrome, multiple sclerosis, stroke survivors, transplant, and the general population. The QLI is unique in that it measures subjective satisfaction in each domain of quality of life as well as the importance of each domain to the subject. Sixteen intervention studies have been published in which QLI scores were found to be sensitive enough to detect a change in quality of life. The QLI scores changed significantly over time when compared before and after an intervention in all studies (Ferrans & Powers, 1992).

### *Canadian Occupational Performance Measure*

The Canadian Occupational Performance Measure (COPM) is an individualized outcome measure that is “client-centered and incorporates role and role expectations within the client’s own environments” (Law et al., 1990, p. 84). The COPM was developed from the Canadian Model of Occupational Performance and measures performance in the areas of self-care, productivity and leisure. The Canadian Association of Occupational Therapists describes occupational performance as the performance of activities and tasks of everyday life.

The COPM uses a semi-structured interview to enable the individual to identify areas of difficulty in occupational performance. The first phase includes problem identification by client. Each problem is rated on a scale from 1 (not important) to 10 (very important). Next, the client chooses up to five of their most important identified problem areas. For each of the five problems, clients score their current level of performance and their satisfaction with that performance on scales of 1 (unable to perform, not satisfied) to 10 (able to perform, extremely satisfied). Scores are totaled for both performance and satisfaction and averaged over the five problem areas. On reassessment, clients review their identified areas of concern and rate their performance and satisfaction. The initial and reassessment scores are then compared and evaluated for change (Law, LeClair & Steinwender, 1998).

In a pilot study, 68.2% of sites reported the COPM to be helpful in guiding assessment and intervention (Law et al., 1994). Although the COPM is valued for its contribution to assessment and intervention, it has also been considered to be both time-consuming and difficult to administer (Toomey, Nicholson & Carswell, 1995). McColl, Paterson and Law (2000), examined client perceptions of the COPM and found that all of the



individuals understood the instructions provided by the interviewer. In addition, 75% of the subjects stated yes when asked if the COPM was helpful in identifying problems.

### Summary

Liver transplantation is the only treatment of choice for chronic liver disease. The illness distress associated with liver disease and transplantation involves every aspect of the individual's life (physical, psychological, social and spiritual) and impacts the individual's quality of life, an important outcome measure of life satisfaction and well-being (Belle, Hoofnagle, Lake, Porayko and Zatterman, 1997). This literature review describes both pre and post liver transplantation patients face a myriad of stressors, including waiting time, surgery, recuperation, complications and changes associated with life style and family dynamics (Bass et al., 1991). Persons with end-stage liver disease often suffer from generalized weakness, fatigue, mental status changes and the reduced ability to perform activities of daily living.

Occupational therapists have unique training and experience in handling mental and physical impairments of those with medically compromising diseases. They help people regain, develop, and build skills that are important for independent functioning, health, well-being, security and happiness (AOTA, 2007). Occupational therapy intervention for those awaiting liver transplantation aides in assisting and providing a safe environment for the person living with the progressive disease process, facilitates the strength and endurance necessary to under-go such a complex surgery as well as promotes improved functional outcomes post surgery (Hasting et al., 2004). The literature reveals that the end-stage liver

diseased population experiences a decline in functional performance. There is minimal documented evidence that discusses the impact of occupational therapy services with this patient population, therefore future studies are indicated and would be beneficial.

The purpose of this project was to design a comprehensive education program for both pre-surgical and post surgical liver transplant patients and families that will assist the patients to achieve the highest level of function possible in all performance areas. It focuses on engaging clients in meaningful occupations that promote social engagement and increased quality of life.

### CHAPTER III

#### METHODOLOGY

Diseases of the liver, bile duct and gallbladder are major causes of morbidity and mortality in the United States. Thousands of people die each year from end-stage liver disease (Larson & Curtis, 2006). Once established, the clinical course of end-stage liver disease is unpredictable and can gradually increase disability, characterized by fatigue and mental confusion, fluid retention and protein wasting (Burke, 2003). The gradual decline is often punctuated by dramatic episodes of gastrointestinal bleeding and susceptibility to severe infections (Larson & Curtis, 2006).

Liver transplantation has become a frequently used treatment for acute liver failure and end-stage liver disease and often the only option to those with hepatic dysfunction. Liver transplantation is initiated only when the patient has irreversible end-stage liver disease that is refractory to other forms of conventional therapy. Patients on the liver transplant waiting list experience a decline in functional performance or may expire while waiting. The longer waiting times for transplantation place patients at higher risk as the disease progresses. The illness distress associated with liver disease and transplantation involves every aspect of the individual's life (physical, psychological, social and spiritual) and impacts the individual's quality of life, an important outcome measure of life satisfaction and well-being (Belle, Porayko, Hoofnagle, Lake, & Zatterman, 1997).

In order to help persons with end-stage liver disease and assist families/caregivers to obtain the tools to promote independent functional performance, the author of this scholarly

project felt it was important to develop a series of educational sessions for persons with end-stage liver disease and the family/caregivers whom provide care and support. The purpose of this educational series is to design a comprehensive education program for pre-surgical liver transplant patients and families/caregivers awaiting transplant that will assist the patients to achieve the highest level of function possible with the disease progression in all performance areas. It will provide detailed information and education to the families/caregivers regarding the disease progression and encouragement to involve the patient in functional tasks, routine exercises and positioning techniques. It will also provide a glimpse into post surgical activity guidelines following liver transplantation. The education sessions will focus on engaging clients in meaningful occupations that promote social engagement and increased quality of life through the waiting period and recovery process for liver transplantation.

A review of literature and research was conducted to collect accurate and current information end-stage liver disease and care of the pre and post liver transplant candidate. The search engines of PubMed, SCOPUS, and OT Search were utilized to find relevant journal articles. Journal articles were obtained through the University of North Dakota and The Mayo Clinic Arizona library's online library resources. Additional information in this project is based upon the author's fifteen years of clinical experience as an occupational therapy and nine years of working with this patient population. The Organ Procurement and Transplantation Network (OPTN) website (<http://www.optn.org>), The United Network For Organ Sharing (UNOS) website (<http://www.unos.org>) and The Mayo Clinic website (<http://www.mayoclinic.org>) were useful and informative for information related to liver transplantation. This project was developed due to current needs in the clinical setting and was identified to address occupational therapy interventions for pre and post liver transplant

candidates. Assessments were identified to address the problem areas in occupational performance and the client's perception of his/her quality of life during the process of this life threatening illness and treatment process. Researching the professional literature in quest of evidence-based support then pursued the selection of these assessments.

The first body of literature that was reviewed described the overview of end stage liver disease, including a brief description of pre-transplant candidates and post-transplant recipients and the role of occupational therapy. The second body of literature discussed the model for classification and ranking of the disease process. The third body of literature described key factors of functional performance, cognition, complex medical complications and osteoporosis. The fourth body of literature discussed the quality of life during both the pre and post transplant phases and the role of occupational therapy for this patient population. The final area of literature reviewed assessments that would measure quality of life and identify problem areas in occupational performance.

The product of this scholarly project is a series of educational sessions for individuals with end-stage liver disease. Family and caregivers are invited to the sessions to assist the patients in achieving the highest level of function possible. The information contained in the product was based on current journal articles and research developed for liver transplantation candidates.

The, *Living With End-Stage Liver Disease* sessions were developed by incorporating two adult learning theories: social and cognitive adult learning theories. The social learning approach is emphasized during this teaching method and cognitive principles are applied in that the individuals are practicing self-regulation and control of what he/she is learning. During social learning, people learn from one another, encompassing such concepts as

observational learning, imitation, and modeling. Bastable (2006) reports that role modeling demonstrates behavior, which is perceived by the learner as reinforced and could facilitate and or inhibit learning. With social learning, people can learn by observing the behaviors of others and the outcomes of those behaviors, learning can occur without a change in behavior and the consequences of behavior play a role in learning. Social learning theory believes that learning occurs largely through modeling without environmental influence. The cognitive learning theory (Bastable, 2006) was utilized in order for the learners to be able to incorporate their own perceptions, thoughts, and memories from their own experiences in order to enhance the materials being learned in the educational session.

## CHAPTER IV

### THE PRODUCT

#### Purpose

Historically occupational therapists are interested in working with the human-environment interaction in order to help maintain independence for individuals faced with declining function due to aging, disease or injury. Persons with end-stage liver disease often suffer from generalized weakness, fatigue, mental status changes and the reduced ability to perform activities of daily living (Burke, 2003). Patients on the liver transplant waiting list experience a decline in functional performance or may expire while waiting.

Occupational therapists have unique training and experience in handling mental and physical impairments of those with medically compromising diseases. They help people regain, develop, and build skills that are important for independent functioning, health, well-being, security and happiness, (AOTA, 2007). Occupational therapy intervention for those awaiting liver transplantation aids in assisting and providing a safe environment for the person living with the progressive disease process, facilitates the strength and endurance necessary to under-go such a complex surgery as well as promotes improved functional outcomes post surgery (Hasting, Gowans, & Watson, 2004).

#### Description

The occupational therapy intervention process outlined within this project will be initiated through referrals from physicians associated within the hospital's liver transplant

team. A physician's order for this service should be written as occupational therapy pre-liver transplant educational teach. The educational teach will include the patient and those family members or caregivers whom will be involved to the care of the patient both prior to and following liver transplantation. If additional individualized occupational therapy intervention is needed pre or post-liver transplantation, the physician's orders should read, occupational therapy, evaluate and treat and include the patient's diagnosis. All educational sessions and assessments will be administered by occupational therapists familiar with the complexities of end-stage liver disease and pre and post-liver transplant recovery process. Based on a comprehensive literature review, it was clear that persons with end-stage liver disease and post-liver transplantation experience a progressive disease-related decompensation in functional performance, cognition and suffer from complex medical complications including osteoporosis that reduces the patient's quality of life and "face a myriad of stressors, including waiting time, surgery, recuperation, complications and changes associated with life style and family dynamics" (Bass & Bindon-Perler, 1991, p. 59).

For individualized treatment programs, the occupational therapy assessment will entail a review of the medical record and specific standardized assessments including

- The Quality of Life Index-Liver Transplant
- The Canadian Occupational Performance Measure (COPM)

### Frame of Reference

The purpose of occupational therapy is to help people maintain independence in all facets of their lives despite the presence of disability or impairment. To maintain independence while making healthy life choices is important to a person's sense of self-



efficacy and happiness. Occupational Therapy is a profession with a strong emphasis on problem solving; as we work with the person-environment interaction, people and environments can vary widely. Combining different people with different environments and situations can create a near infinite variety of situations. End-stage liver disease presents itself with varying disease complexities that can limit one person's ability to function independently while another person experiences the same disease process can learn to adapt. Occupational therapy intervention both pre and post-liver transplant can help people regain, develop, and build skills that are important for independent functioning, health, well-being, security and happiness (AOTA, 2007). Occupational therapy intervention for those awaiting liver transplantation aides in assisting and providing a safe environment for the person living with the progressive disease process, facilitates the strength and endurance necessary to under-go such a complex surgery as well as promotes improved functional outcomes post surgery (Hasting, Gowans, & Watson, 2004).

The Ecology of Human Performance Model (EHP) is a theoretical model, which emphasizes the context in which activities occur (Reitz & Scaffa, 2001). The complexities of the end-stage liver disease process fits well within this theoretical model. The major components identified in this model include: the person and his or her skills, abilities, tasks and performance range. Selection of tasks by the person is accomplished after consideration of the basic behaviors required to complete the tasks, and the perception of their skills. This consideration takes place in the setting of the specific context in which the behavior must occur. A person who demonstrates competence in making decisions related to daily tasks such as bathing and dressing may struggle to make decisions when taking medications due to the required complexity of the task. The person first approach of the occupational therapist

and the wide view of the human experience is a perfect fit for this model and the person with end-stage liver disease awaiting liver transplantation and the post surgical recovery process. This model describes therapeutic intervention in five areas; first, the *establish/restore* level which seeks to restore function by improving a persons skills and abilities. Second, *adapting* the demands of the tasks and contextual aspects is used to increase success. Third, *alteration* or a complete change of the context to better fit the person's skill level. Fourth, *preventing* maladaptive behaviors that could hinder performance is used. Last, *creating* situations or contexts that promote success with more complex performance is a useful intervention in this model.

Applying the EHP model to the pre and post-liver transplant population is appropriate as it works well to support the objective of the pre-transplant education session and the post-liver transplantation occupational therapy goals: To identify potential threats to independence when different skills, abilities, and contextual issues create a mismatch or inability to perform. These threats are considered in the context of a persons experience and values as well as the expectation of the community. When the skill or ability is identified to be creating a mismatch such as diminished cognition, decreased strength and endurance, the objective of occupational therapy is to assist in the decision making process to address the mismatch in the best possible way. Adaptation, alteration, or prevention are all appropriate to an individual's occupation based activities/functional performance. Often there are ways to remediate the problem and in other instances alteration of contexts allow the person to maintain independence by helping with community resources such as support groups, meal distribution programs, pharmaceutical delivery programs, caregiver respite assistance or by rallying support from family and friends to assist with activities of daily living skills and

home exercise programs. As continuation of this occupational therapy education and intervention program, more community based education is appropriate with inclusion of a support group, dietary consult, physical therapy and recreational therapy can be developed to work synergistically with the occupational therapy program presented here.

### Product

The author has created a series of educational sessions for patients and families/caregivers via power point presentation and group participation. Caring for the person with end-stage liver disease-awaiting transplantation and post-transplant can be a difficult task.

The purpose of this educational series is to design a comprehensive education program for pre-surgical liver transplant patients and families/caregivers awaiting transplant that will assist the patients to achieve the highest level of function possible with the disease progression in all performance areas. It will provide detailed information and education to the families/caregivers regarding the disease progression and encouragement to involve the patient in functional tasks, routine exercises and positioning techniques. It will provide a glimpse into post surgical activity guidelines following liver transplantation.

The education sessions will focus on engaging clients in meaningful occupations that promote social engagement and increased quality of life through the waiting period and recovery process for liver transplantation. Individual patients will participate in activities of daily living, which will increase functional mobility, strength and belay the fears of anxiety about the physical manifestations of the disease process. The instructor of each session will

be an occupational therapist that is well versed on the diagnosis of end stage liver disease and recovery following liver transplantation

Each session includes a power point presentation containing all information presented in a group/classroom format. There is a separate page for each power point, containing notes to guide the instructor through the class. A handout is provided for the patients and families/caregivers with the pertinent information provided in the session and allows space for notes. In order to help the patients and families/caregivers retain the information and obtain good understanding of exercise programs, demonstrations and group activities are included. The final part of the handout includes exercises that can be utilized and modified for every person pre and post-liver transplantation and any level of function.

### Conclusion

The occupational therapist is a key member of the interdisciplinary transplant team who aids in providing a comprehensive approach to the patients' recovery. Traditional treatment interventions include providing necessary durable medical equipment or adaptive devices, energy conservation instruction, activities of daily living re-training, gross strengthening exercises, instruction in body mechanics and cognitive re-training.

It is anticipated that the individuals will be able to enhance quality of life by engaging in occupations that will promote the highest functional level possible (Bass et al., 1991). Individual patients will participate in activities of daily living, which will increase functional mobility, strength and belay the fears of anxiety about the physical manifestations of the disease process.

## CHAPTER V

### SUMMARY

The series of educational sessions are intended to help persons with end-stage liver disease and their families/caregivers during the pre and post surgical process. Occupational therapy intervention for those awaiting liver transplantation aides in assisting and providing a safe environment for the person living with the progressive disease process, facilitates the strength and endurance necessary to under-go such a complex surgery as well as promotes improved functional outcomes post surgery (Hasting, Gowans, & Watson, 2004). The sessions will provide detailed information and education to the families/caregivers regarding the disease progression and encouragement to involve the patient in functional tasks, routine exercises and positioning techniques which will focus on engaging clients in meaningful occupations that promote social engagement and increased quality of life through the waiting period and recovery process for liver transplantation.

Each participant will be provided with a handout with the pertinent information provided in the session and allows space for notes. In order to help the patients and families/caregivers retain the information and obtain good understanding of exercise programs, demonstrations and group activities are included. Each client will receive an individualized home exercise program.

After attending the sessions, all participants should be able to more effectively identify the difficulties with the disease progression and recovery from liver transplantation. Secondly, the families/caregiver will be provided with the opportunity to learn about intervention strategies that can be implemented in their home with the assistance of an

occupational therapist. The information and strategies provided will help to better manage the difficulties faced and hopefully facilitate engagement in occupational performance during this critical illness. During each session, the participants engage in a group activity and will be given time to review previous information and answer questions. The sessions will allow participants to share information, learn from one another and expand upon their support system.

The instructor of each session will be an occupational therapist that is well versed on the diagnosis of end-stage liver disease and the recovery process following liver transplantation. The educational teaching series will consist of five, one and half hour sessions that will include the patient and those family members or caregivers whom will be involved to the care of the patient both prior to and following liver transplantation. Maximum class size will be 5 patients and his/her designated primary caregivers (total of 10 to 15 people). If individualized occupational therapy intervention is needed pre or post liver transplantation, the occupational therapist will consult with the transplant team and complete a comprehensive evaluation and plan of care.

Recommendations for future action include updating the sessions with current research as it becomes available. The literature reveals that the end-stage liver diseased population experiences a decline in functional performance. There is minimal documented vidence that discusses the impact of occupational therapy services with this patient population, therefore future studies are indicated and would be beneficial.



## APPENDICES



APPENDIX A

LIVING WITH END-STAGE LIVER DISEASE  
GROUP PROTOCOL

Protocol:

The occupational therapy intervention process outlined within this project will be initiated through referrals from physicians associated within the hospital's liver transplant team. A physician's order for this service should be written as occupational therapy liver transplant series. All patients activated on the liver transplantation surgical list, including both cadaveric and living donor liver transplant candidates will be referred to occupational therapy prior to liver transplantation for education. The educational teaching series will consist of 5 one and half hour classes that will include the patient and those family members or caregivers whom will be involved to the care of the patient both prior to and following liver transplantation. Maximum class size will be five patients and his/her designated primary caregivers (total of 10 to 12 attendees). All educational sessions and assessments will be administered by occupational therapists familiar with the complexities of end-stage liver disease and pre and post-liver transplant recovery process.

Learning Objectives: Following completion of the educational series titled "Living with End Stage Liver Disease", Sessions 1-5:

- 1) The participants will be able to identify signs and symptoms of disease progression.
- 2) The participants will be able to use compensatory techniques to perform purposeful activities.
- 3) The participants will be able to independently monitor activity levels using the Perceived Exertion Scale.
- 4) The participants will demonstrate effective strategies to achieve good posture for sitting, standing and sleeping.
- 5) The participants will learn strategies for preventing infection.
- 6) The participants will verbalize good understanding of post liver transplant activity expectations.

APPENDIX B

LIVING WITH END-STAGE LIVER DISEASE  
SESSION 1

Title of Presentation: Living With End-Stage Liver Disease: Session 1

Intended Audience: Patients and family/caregivers whom are awaiting liver transplantation

Learning Objectives:

- 1) The participant state two reasons to have a liver transplant.
- 2) The participant will identify benefits of liver transplantation.
- 3) The participant will describe the functions of the liver.
- 4) The participant will gain an increased awareness of indications and criteria for liver transplantation.
- 5) The participant will learn how to recognize symptoms of liver disease progression.
- 6) The participant will participate will demonstrate correct hand-washing techniques.

Agenda:

- Overview of Liver Transplantation
- Anatomy of the Liver
- Signs and Symptoms of Disease Progression
- Group Hand Washing Activity
- Quality of Life Index (individual assignment)
- Schedule individual COPM.
- Question & Answer Session

Teaching Materials:

- 1) Power Point Presentation
- 2) Handouts of power point presentation with space for writing notes
- 3) Equipment: For Hand washing activity:
  - a) Sink
  - b) Soap & Water
  - c) Germ Juice
  - d) Infrared light
- 4) The Quality of Life Index
- 5) The Canadian Occupational Performance Measure (COPM)

# Liver Transplantation Overview Session 1

- Group Discussion

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Therapist introduction and role of OT with end stage liver disease and liver transplantation.

Introductions of transplant recipients and family/caregivers whom accompanied them.

Request patient's to identify his/her liver disease and most noticeable/bothersome side effects

Have family/caregivers discuss disease symptoms and share information

## Liver Transplantation: “A treatment, not a cure”

- Goals
- No guarantees

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### Goals

Trade a life-threatening illness for a lifelong condition  
Prolong and improve the quality of life

### No guarantees

Original disease may recur  
New liver may not work  
Transplant may not improve other aspects of your life

## Benefits of Liver Transplantation

- Increased feeling of well-being
- Fewer restrictions on diet and activities
- Increased energy level
- Improved physical appearance
- Return to “normal” lifestyle

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Improved occupational performance

## What to expect from Liver Transplantation

- Surgery is very complex
- Requires close monitoring from the team
- May or may not require blood transfusions
- Expect at least one “bump in the road”

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Team Approach: Patient, Support System, Transplant Surgeons/Hepatologists, Transplant Physician Assistants, Transplant Nurse Coordinators, Transplant Social Workers, Psychiatrist, Transplant Pharmacist, Clinical Nurse Specialist, Transplant ICU & Unit Nurses, Transplant Anesthesiologist/Surgical Team, Occupational Therapist, Physical therapist, Dietitian, Transplant Financial Counselors

### “Bump in the Road”

Infection: At times return to surgery for abdominal wash outs.  
May require additional antibiotics for treatment of infection

Rejection: Common with organ transplants , May require additional medications

Additional Rehabilitation: May require additional rehab (therapy interventions) prior to discharge home

# The Liver's Function

\*The Liver does over 500 Jobs

- ✓ The liver secretes bile, which aids in digestion
- ✓ Stores substances like vitamins
- ✓ Removes wastes from the blood

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The largest solid organ in the body

Weights 3-4 lbs

Approximate size of a football

Located on your right side under the ribcage

Has two lobes: right lobe

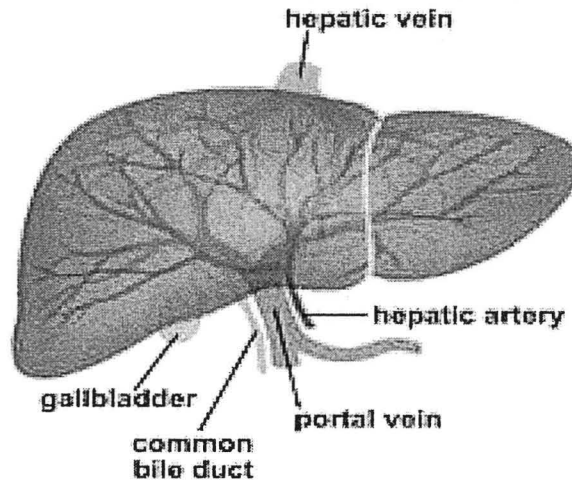
left lobe

## Primary Functions of the Liver

- Stores vitamins, minerals and sugars
- Regulates blood clotting factors
- Metabolizes alcohol
- Transforms hormones to active forms
- Manufactures proteins, especially albumin
- Helps the body resist infection/produces immune factors
- Controls production and excretion of cholesterol
- Makes & secretes bile



# The Liver's Process



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Blood enters the liver from the hepatic artery and hepatic portal vein and leaves via the hepatic vein

Blood from the artery carries  $O_2$

Portal vein carries nutrients from intestine

Biliary tree carries bile from liver to intestine

Photograph: "By permission of Mayo Foundation for Medical Education and Research. All right reserved". April 10, 2008

## Symptoms of Liver Disease

- Jaundiced; yellowing of the skin & eyes
- Dark colored urine, light colored stool
- Loss of appetite
- Fluid Retention (Ascites)
- Prolonged itching
- Sleep disturbances
- Fatigue
- Mental confusion (Encephalopathy)

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Fluid Retention (Ascites): often requires thoracentesis to pull off extra fluid that is measured by liters

Encephalopathy: Often noted first by family/caregivers

# Complications of ESLD

- Encephalopathy
- Variceal bleeding
- Bacterial peritonitis
- Ascites
- Cholangitis

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Encephalopathy: Mental confusion with high ammonia levels treatment is often times taking lactulose medication

Variceal bleeding: small blood vessels in the esophagus

Bacterial peritonitis: infection in the lining of the abdomen

Ascites: fluid collection in the abdomen

Cholangitis: inflammation of the bile ducts

# Indications for Liver Transplant

- The liver can no longer manufacture important elements our body needs in order to live

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Converting bilirubin to bile

Production of blood clotting factors

Production of albumin: United Network of Organ Sharing(UNOS). The most well-known type of albumin is the serum albumin in the blood.

Serum albumin is the most abundant blood plasma protein and is produced in the liver and forms a large proportion of all plasma protein. The human version is human serum albumin, and it normally constitutes about 60% of human plasma protein.

Serum albumins are important in regulating blood volume by maintaining the osmotic pressure of the blood compartment.

## Criteria for Liver Transplantation

- Must meet UNOS medical indications
- Must have good heart, lung & kidney function
- Must have good support system
- Documented abstinence from alcohol, smoking & chemically dependent drugs
- Adequate financial resources (insurance) for immunosuppressant meds

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UNOS: United Network of Organ Sharing

# MELD

- MELD was developed by Kim, Kamath, Malinchoc at Mayo Clinic Rochester
- MELD reviewed and approved by:

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Score for depicting the urgency of liver transplant

- 1) Initially stood for Mayo End Stage Liver Disease Score, now Model for End Stage Liver Disease. Malinchoc M et al. Hepatology 2000; 31:864-871
- 2) First sent out to the general public for their comments  
various committees of UNOS/OPTN  
Board of Directors of the UNOS/OPTN gave the final approval to go into effect 2/02
- 3) Name changed to Model of End Stage Liver Disease for national use.

# MELD

- A means of giving adult liver candidates a 'score' based on how urgently they need a transplant within the next three months
- Calculated by a formula using routine lab tests
- More precise method of ranking patients

# MELD Equation

- $MELD = (0.957 \times \ln(\text{creatinine}) + 0.378 \times \ln(\text{bilirubin}) + 1.12 \times \ln(\text{INR}) + 0.643 \times 10)$
- Capped at 40

57

Formula calculated by the Hepatologists and transplant surgeons



## Transplant Centers in the US (March 26, 2008)

- Heart-Lung Transplant Programs: 53
- Heart Transplant Programs: 131
- Intestine Transplant Programs: 45
- Kidney Transplant Programs: 245
- Liver Transplant Programs: 127
- Lung Transplant Programs: 66
- Pancreas Transplant Programs: 145
- Pancreas Islet Cell Transplant Programs: 30

# Liver Transplants

- Currently there are 16,932 patients nationally on the waiting list
- In 2007 there were 6,492 performed in the U.S

<http://www.unos.org/>

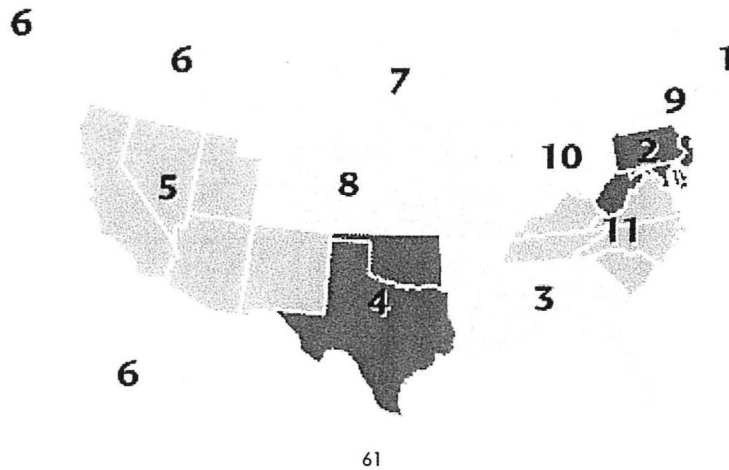
59

Statistics tab of the web site

## United Network for Organ Sharing (UNOS)

- Maintains the nation's organ transplant waiting list
- Brings together medical professionals, transplant recipients, and donor families to develop organ transplantation and allocation policies.

# UNOS Region Map



## Who can be a donor?

Anyone interested in becoming a living donor must first be carefully evaluated. Doctors examine potential donors to help determine whether it is the best and safest option for the donor and the recipient.

A donor must: be between the ages of 18 and 55.

Have good general health, have a blood type compatible with the recipient

The donor's sole reason for donating must be an unselfish wish to help the recipient.

Only about one in three people who have been evaluated for live donation turn out to be a suitable candidate.

# Types of Liver Transplants

- Cadaveric
- Living donor
- Split

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## **Cadaveric liver transplantation**

The majority of livers that are transplanted come from deceased organ donors.

These donors are adults or children who have become critically ill (often due to an accidental injury) and will not live as a result of their illness or injury.

If the person is an adult, he or she may have agreed to be an organ donor before becoming ill.

Parents or spouses can also agree to donate a relative's organs.

**Living Donor:** living donor liver transplantation has been developed to help overcome the organ donor shortage and save lives.

This procedure involves removing a portion of a healthy living donor's liver to help someone already on the waiting list for a cadaveric liver.

With the increasing number of deaths each year in adults on the liver transplant list, combined with the growing shortage of deceased donors this is a good option to help save lives.

There are two big advantages to living donor transplantation:

1. Once a living donor has been found, the operation can be scheduled at the donor's and recipient's convenience. The recipient can receive the transplant before his or her liver disease has progressed to a severe stage.
2. Once the disease progresses to the severe stage, cadaveric liver transplantation can lead to a poor outcome. For the donor, there is the benefit of knowing that he or she has contributed to another person's life in a very meaningful way.

## **Sharing a Liver**

Occasionally when a donor liver becomes available, it is too big for the intended patient. If a patient is petite, a liver from a larger donor will not fit the patient.

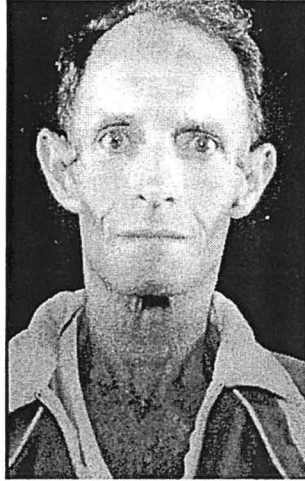
The donor liver is cut, or "split," so that it is in two smaller pieces. This smaller size is a better fit for the smaller patient. The other half of the liver can then be transplanted into another smaller-sized patient, such as a child or another petite adult. This split-liver procedure allows two people to share one liver. However, this procedure is not suited for all patients.



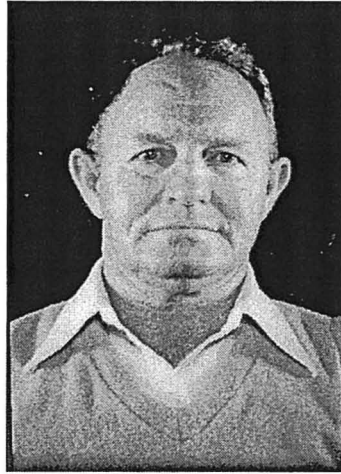
## Possible “Bumps in the Road”

- Infection
- Rejection
- Bleeding
- Bile leaks
- Narrowing of blood vessels or bile ducts
- Medication side effects
- Other

## Before Transplant



## After Transplant





## A Creed to Life A Transplant Patient's Promise

I will not quit, give up, or die, without a fight.

I will not give in to the negative, rather act  
for the positive.

I will ask God for the strength to proceed  
when I feel I cannot.

I will because I choose to, not because I  
have something to prove.

66

Author Unknown

## A Creed to Life A Transplant Patient's Promise

I will lead the fight if you will help, follow, or  
push me from behind.

I will not let the negative stand in my way,  
rather I will walk all over it.

I will accept God's plan, and act in a  
manner to show others that they can  
endure as I have, and many before me.

*Authors name withheld by request*

# HANDWASHING

- Alcohol-based hand sanitizers
- Soap and Water

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## **Proper use of an alcohol-based hand sanitizer**

Center for Disease Control:

Alcohol-based hand sanitizers — which don't require water — are an excellent alternative to hand washing, particularly when soap and water aren't available. They're actually more effective than soap and water in

killing bacteria and viruses that cause disease. Commercially prepared hand sanitizers contain ingredients that

help prevent skin dryness. Using these products can result in less skin dryness and irritation than hand washing.

Not all hand sanitizers are created equal, though. Some "waterless" hand sanitizers don't contain alcohol. Use only the alcohol-based products. The CDC recommends choosing products that contain at least 60 percent alcohol.

Hand hygiene is the practice of cleansing and sanitizing your hands. It is a simple and effective method of preventing

the spread of infection. It helps keep you from getting sick as well as reducing the risk of spreading bacteria or viruses

that may cause infection in others.

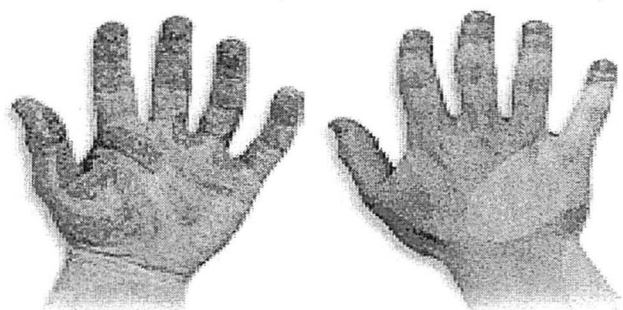
To use an alcohol-based hand sanitizer:

- Apply about 1/2 teaspoon of the product to the palm of your hand and spread the gel or foam over all parts of
- your hands for 5 to 10 seconds.
- Rub your hands together, covering all surfaces of your hands, until they're dry.

If your hands are visibly dirty, however, wash with soap and water, if available, rather than a sanitizer.

# Hand Washing

## MISSED SPOTS WHEN HAND-WASHING



- MOST FREQUENTLY MISSED
- LESS FREQUENTLY MISSED
- NOT MISSED

## Hand Washing Activity



<http://www.germjuice.com/Products.html>

70

1. Have participants wash hands with soap and water
2. Use GermJuice on hands
3. Use infrared light to allow the participants to see how effectively they washed their hands

## Quality of Life Index

- Measures quality of life in terms of satisfaction with life.
- Measures both satisfaction and importance regarding various aspects of life.
- The QLI produces five scores:  
quality of life overall and in four domains (health and functioning, psychological/spiritual domain, social and economic domain, and family).

<http://www.uic.edu/orgs/qli/>

71

The World Health Organization defines the quality of life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. Health care providers are concerned with quality of life because it may affect decisions regarding prescribing habits, treatment regimens, and decisions to cease treatment.

A number of versions of the QLI have been developed for use with various disorders and the general population, and have been reported in more than 200 published studies. A common set of items forms the basis for all versions, and items pertinent to each disorder were added to create the illness-specific versions.

Each transplant candidate will complete.

## COPM Assessment

- Outcome measure administered at the beginning of OT services and again at appropriate intervals thereafter.
- An individualized measure that detects change in client's self-perception of occupational performance over time.
- Reflects client-centered approach that allows for therapists to evaluate the results of their interventions.

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Canadian Occupational Performance Measure will be administered by an OT during the scheduled individual session.

# COPM

- ID problem areas in occupational performance
- provide a rating of a client's priorities in occupational performance
- evaluate performance and satisfaction relative to those problem areas
- measure changes in a client's perception of his/her occupational performance over the course of OT intervention
- Designed to be used for clients with a variety of disabilities and across all developmental stages

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Encompasses occupational performance areas of self-care, productivity, and leisure as primary outcomes.

Recognizes performance components as essential to the process of occupational performance.

Incorporates the roles and role expectations of the client

Considers the importance of performance areas to the client.

Measures client-identified problems.

Incorporates reassessment of identified problem areas.

Focuses on the client's own environment, thereby ensuring the relevance of the problems to the client.

Considers client satisfaction with present performance.

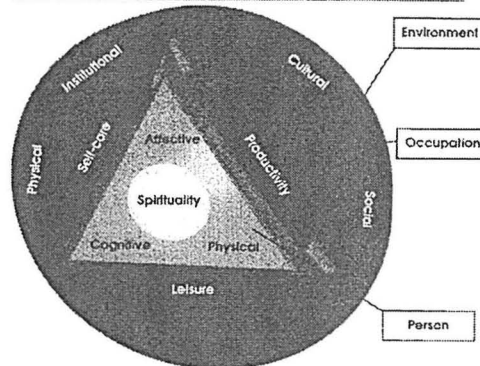
The COPM is responsive to changes in the client's self-perception of occupational performance of time.



# Occupational Performance

## DEFINITION OF OCCUPATIONAL PERFORMANCE

Figure 1  
Canadian Model of Occupational Performance



From *Enabling Occupation: An Occupational Therapy Perspective*, © CAOT 1997.

Based on the Canadian Model of Occupational Performance.

This model illustrates that occupational performance occurs as a result of interactions between the person, the environment and occupations.

Questions?



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Review schedule of remainder sessions

## APPENDIX C

### LIVING WITH END-STAGE LIVER DISEASE SESSION 2

Title of Presentation: Living With End-Stage Liver Disease: Session 2

Intended Audience: Patients and family/caregivers whom are awaiting liver transplantation.  
Must have completed session 1.

Learning Objectives:

- 1) The participant will describe the role of occupational therapy in the liver transplant population.
- 2) The participant will prioritize individual areas of occupational performance.
- 3) The participant will learn how to use the Perceived Exertion Scale to monitor individual intensity of one's participation in exercise and functional tasks.
- 4) The participant will identify three energy conservation techniques that can be utilized during activities of daily living tasks.
- 5) The participant will describe available assistive devices that can increase functional performance and reduce energy consumption.
- 6) The participant will describe his/her physical and emotional responses to stress.

Agenda:

- Define occupational therapy
- Educate on energy conservation techniques
- Define Perceived Exertions Scale
- Group discussion on developing individual's energy conservation techniques
- Question & Answer Session

Teaching Materials:

- 1) Power Point Presentation
- 2) Handouts of power point presentation with space for writing notes

# **Living With End-Stage Liver Disease**

## **Session 2**

“Rehabilitation is to be a  
master word in medicine.”

William J. Mayo

# Occupational Therapy

- Health and rehabilitation profession that helps people:
  - Regain
  - Develop
  - Build skills

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Important for independent functioning, health, well-being, security and happiness

# Population Served

- OT practitioners work with people of all ages who, because of illness, injury, or developmental or psychological impairment, need specialized assistance in learning skills to enable them to lead independent, productive, and satisfying lives. (American Occupational Therapy Association)

## “Skills for the Job of Living”

- ADL's: Activities of daily living
- IADL: Home management tasks



# Perceived Exertion Scale

Rate of Perceived Exertion		
<b>Least effort</b>		
6		
7	very, very light	
8		
9	very light	
10		
11	fairly light	<b>Endurance Training zone</b>
12		
13	somewhat hard	
14		
15	hard	<b>Strength Training zone</b>
16		
17	very hard	
18		
19	very, very hard	
20		
<b>Maximum effort</b>		

The Lifegevity Institute

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Corresponds well both to heart rate and O<sub>2</sub> uptake

Helps one to "listen to his/her body"

Provides accurate gauge of fatigue

Reflects total amount of physical exertion and fatigue during exercise

Target Range for ESLD is 11-14

# Energy Conservation

## Goal:

### Energy Conservation

- Modify tasks
  - Daily activities
  - Leisure
  - Routine tasks

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**Energy conservation** is the practice of decreasing the quantity of energy used. It may be achieved through efficient energy use, in which case energy use is decreased while achieving a similar outcome, or by reduced consumption of energy services.

# Energy Conservation

- Organize
- Delegate
- Schedule
- Reduce sudden or prolonged strains
- Practice proper body mechanics

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Energy Conservation: Plan Ahead

Organize:

Reduce clutter

Minimize extra movements

Delegate:

Ask for help

Schedule:

Set priorities that are realistic

Alternate standing/sitting activities

Break strenuous tasks into smaller segments

Reduce sudden or prolonged strains

Practice proper body mechanics

## Energy Conservation Schedule Rest

- Balance rest and work
  - Take 5 to 15 minute rest for every hour of continuous work
  - Plan several short 5-30 minute rest periods throughout the day after high energy consumption tasks:
    - Showering
    - Vacuuming/Mopping
    - Shoveling/Raking

# Energy Conservation

- Pace Yourself
  - *A moderate pace will use 2 to 3 times less energy than working at a fast pace*

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*Moderate pace will use 2 to 3 times less energy than working at a fast pace*

Heavy Tasks "Slow and Steady"

(including exercise)

Allow enough time - No rushing

Establish a time limit for working

Rest Before Becoming Fatigued

## Energy Conservation Strains

- Avoid activities requiring sudden burst of energy (lifting a child)
- Eliminate heavy tasks
  - Carrying laundry upstairs
  - Mowing

## Energy Conservation

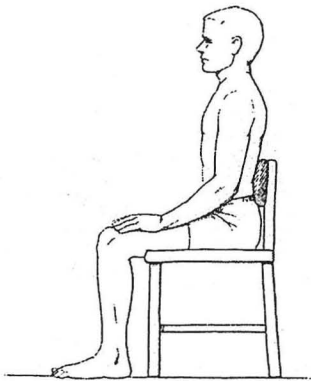
- Sit whenever possible
- Avoid bending over while working
- Adjust work heights
- Proper posture when sitting, standing, sleeping & lifting
- Limit Overhead work
- Limit Isometric work

## Energy Conservation recommendations

- Identify environmental effects
  - Extreme temperatures
  - Take moderately warm shower (sitting)
  - Wear proper clothing
- Reduce stress
- Expand leisure activities



## Energy Conservation Sitting



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- Use good supported sitting posture
- Elevate your legs if sitting for long periods
- Avoid crossing your legs or ankles
- Avoid bent/slouched positions
- Periodically stand, stretch or walk if sitting > 1 hour

Avoid sitting in chairs with legs unsupported

When possible, sit while performing tasks (folding laundry, applying cosmetics, shaving)

Sit on low stools when working at low levels such as gardening

Sit on high stools when working at high levels such as woodworking or cooking

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# Energy Conservation Standing



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- Use good standing position
- Shift weight frequently
- Rest one foot on a low stool & alternate feet
- Alternate standing with sitting to avoid fatigue

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Shift weight frequently so that the work is distributed to different muscles

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## Adjust Work Heights

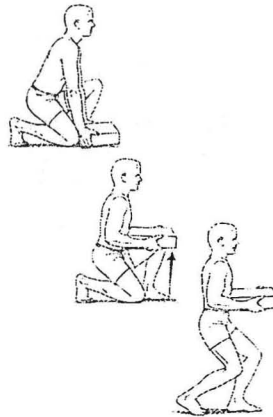
- Adjust table or chair height in order to work
- Position the top of the computer screen at eye level
- Use long-handled tools for gardening, shoveling, mopping
- When sweeping, vacuuming or raking, use short strokes to avoid excessive reaching/bending
- Adjust your position to face your work to avoid twisting your body

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- 1) Avoid bending. Keep our shoulders relaxed while working
- 2) Prevent working in a stooped position

# Handling Objects

- Bend at hips & knees when lifting
- Distribute weight of objects evenly
- Carry close
- Use backpack or shoulder bag
- Slide or roll objects
- Use wheeled carts
- Alternate hands



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- 1) Lift using your legs, maintain natural back curves
- 2) Use several muscles or joints by using both hands
- 3) Carry items close to your body using both hands
- 4) Place shoulder bag strap over your neck and across chest. Shoulder strap should be wide and padded to distribute pressure
- 5) Slide or roll object along countertops, bench or floor
- 6) Use wheeled carts, dollies, or wheelbarrows when moving heavy or bulky objects
- 7) Alternate hands when performing repetitive or prolonged activities

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## Reduce Stress

Monitor tension that builds  
throughout the day

## Physical Reactions to Stress

- Upset stomach
- Tension headache
- Stiff neck or back

## Emotional Responses to Stress

- Irritability
- Depression
- Fatigue

## Anticipate Fatigue & Stress Responses

- Make sure your rested before events that may require extra effort
- Defuse stress before it becomes a problem
- Allow extra time to decrease stress
- Find a healthy way to express your fears & concerns
- Physical exercise can help (seek medical advice prior to starting)



## Remember, your body requires a balance of work & rest

- Symptoms that work is either too fast or too demanding include:
  - Shortness of breath
  - Excessive fatigue
  - Chest pain
  - Light-headedness
  - Overexertion

By using your energy wisely,

You can work to maintain your  
independence as well as make  
your life more productive and  
full-filling.

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Group Activity: Have each person come up with an ADL task they perform daily that caused increased fatigue and then group offer suggestions of completing the tasks using energy conservation techniques.

Wipe Board

Dry Erase Markers

## ADL Re-Training

- Self-care
  - Hand Hygiene
- Home-living
- Durable Medical Equipment
- Assistive Devices
- Lifting Restrictions
- Parenting/Child Care

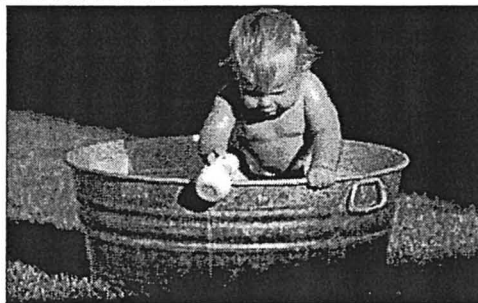
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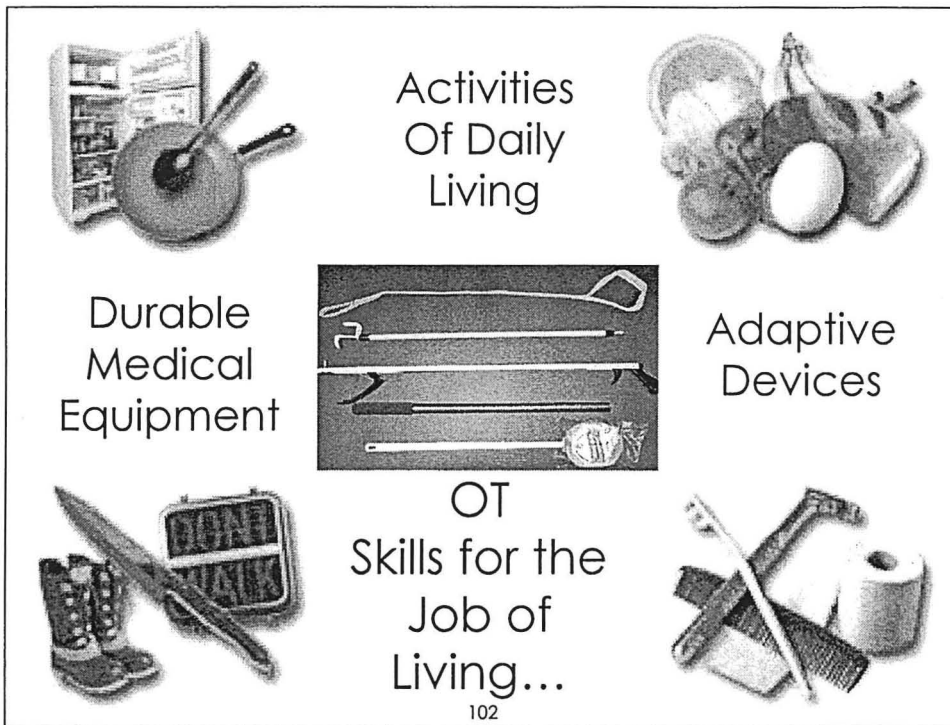
Avoid home remodeling, working in soil, removing carpet and drapes post transplant as this will disrupt spores and fungus

That were dormant. One can not fight off due to immunosuppressant medications

## Adaptive Equipment

- OT's are uniquely qualified to provide individuals with equipment that promotes the highest degree of functional independence.





Adaptive devices are available to assist with saving energy and decrease need for large movements

## Adaptive Equipment Enhances Performance of:

- Personal care activities
- Work activities
- Family activities
- Educational activities
- Vocational activities
- Play or leisure activities

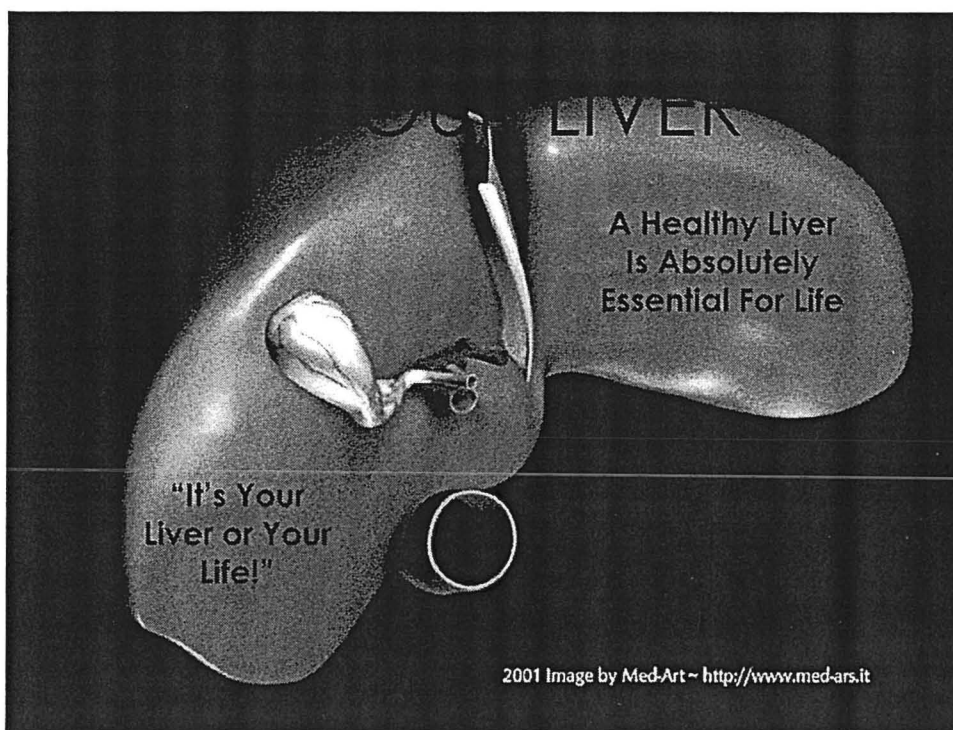
## Types of Adaptive Equipment

- Special eating Utensils
- Home Care Equipment
- Bathing & Dressing Devices
- Technological Devices

## ADL RE-RETRAINING







2001 Image by Med-Art ~ <http://www.med-ars.it>

# Goal

Enhance quality of life  
Maximize safety  
Functional independence.



Thank You!

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Review schedule of remaining sessions

## APPENDIX D

### LIVING WITH END-STAGE LIVER DISEASE SESSION 3

Title of Presentation: Living With End-Stage Liver Disease: Session 3

Intended Audience: Patients and family/caregivers whom are awaiting liver transplantation.  
Must have completed sessions 1 and 2.

Learning Objectives:

- 1) The participant will describe osteoporosis.
- 2) The participant will receive individualized BMD score.
- 3) The participant will demonstrate effective body mechanics during functional tasks.
- 4) The participant will demonstrate effective strategies to achieve good posture for sitting, standing and sleeping.
- 5) The participant will demonstrate log roll technique for safe bed mobility.

Agenda:

- Osteoporosis
- Bone Mineral Density Testing and Results
- BMD Group Activity
- Educate on Body Mechanics & Back Care principles
- Discuss sitting, Standing & sleeping postures
- Log Roll technique instruction and demonstration
- Question/Answers

Teaching Materials:

- 1) Power Point Presentation
- 2) Handouts of power point presentation with space for writing notes
- 3) Therapy plinth for demonstration of log roll and positioning techniques
- 4) Extra pillows for position need

# Living With End-Stage Liver Disease

## Session 3

## Osteopenia

- Low BMD testing
- -1 to -2.5 SD below the norm
- 10-12% decrease in bone density
- No pathological fractures

# Osteoporosis

- Metabolic bone disease
- Low bone mass:  $> -2.5$  below SD norm
- Microarchitectural deterioration of bone
- Increased fracture risk
- 30-50% bone loss b/f detected on plain films

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Osteoporosis results in 1.5 million fractures every year

# WHO Scoring

World Health Organization

- T Score - Number of standard deviations from the mean (average) value of a 25-year-old woman
- Normal bone: T-score better than -1
- Osteopenia: T-score between -1 and -2.5
- Osteoporosis: T-score less than -2.5
- Established osteoporosis *includes the presence of a non-traumatic fracture*
- The Z-score is the number of standard deviations below age-matched average

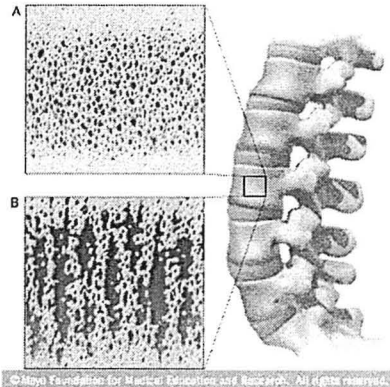
World Health Organization

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One standard deviation is at the 16th percentile, so by definition 16% of young women have osteopenia!

# Bone Mineral Density

- Special X-rays to measure how many grams of calcium and other bone minerals
- The higher your mineral content, the denser your bones are.
- And the denser your bones, the stronger they generally are and the less likely they are to break.



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## Bone density

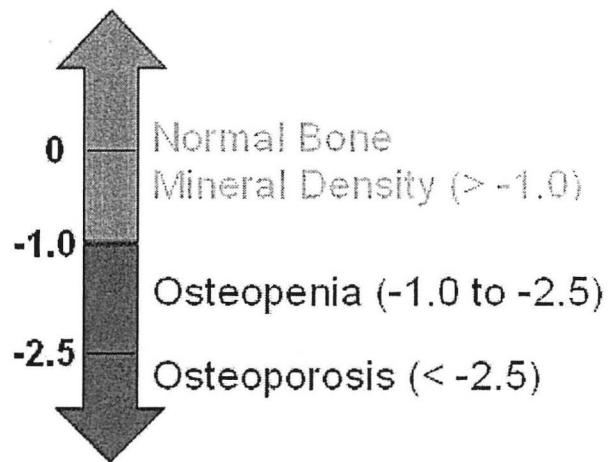
With bone loss, the outer shell of a bone becomes thinner and the interior becomes more porous.

Normal bone (A) is strong and flexible. Osteoporotic bone (B) is weaker and subject to fracture

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## Bone Mineral Density



## Why? Bone Mineral Density Tests?

- Liver disease can weaken bones
- Effects bone mineralization, remodeling, and bone mass
- Increased risk for females
- Age
- Small framed body
- Family history of osteoporosis
- Use of Interferon with Ribavirin (tx of HEP C)
- Use of Corticosteroids (Prednisone)

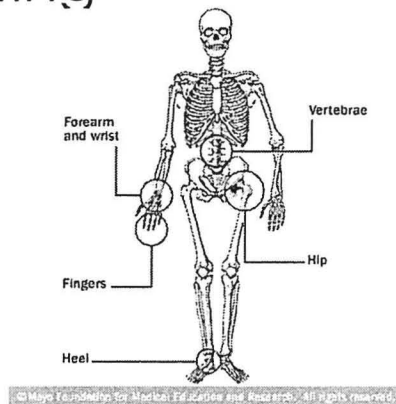
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Osteoporosis can occur at any age

# BMD

## Bone Mineral Density Testing

- Bone density tests are usually done on bones that are most likely to break because of osteoporosis



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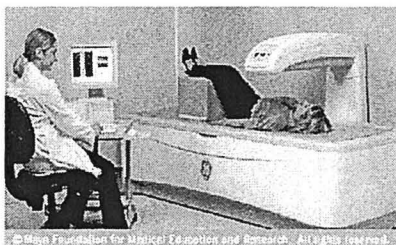
These sites include the lumbar vertebrae, which are in the lower region of your spine, the narrow neck of your femur bone adjoining the hip, and the bones of your wrist and forearm.

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# BMD Testing

- Large machines on which you can lie down (central devices)
- Portable machines that measure bone density on the periphery of your skeleton, such as in your finger, wrist or heel (peripheral devices).

## Dual energy X-ray absorptiometry (DEXA)



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### Central devices

- **DEXA scan.** Dual energy X-ray absorptiometry (DEXA) scans measure the bone density at your hip or spine.
- This test offers very precise results and is the preferred test for diagnosing osteoporosis. During this test, you
- lie on a padded platform for a few minutes while an imager — a mechanical arm-like device — passes over your body.
- It won't touch you. The test does, however, emit radiation, though your exposure during a bone density test is commonly
- about one-tenth of the amount emitted during a chest X-ray. This test usually takes five to 10 minutes to complete.
- **Quantitative CT scan.** This test uses a computerized tomography (CT) scanner combined with computer software to
- determine your bone density, usually at your spine. Quantitative CT (QCT) scans provide detailed, 3-D images and can take
- into account the effects of aging and diseases other than osteoporosis on your bones. QCT scans emit more radiation than
- DEXA scans do. For a QCT test, you lie on a movable table that's guided into a large tube-like area where images are taken.
- It typically takes less than 10 minutes.

### Peripheral devices

Peripheral devices are found in pharmacies and are considerably less expensive than are central devices. But these smaller machines do have limitations.

Measurements taken at your hip and spine generally are considered more accurate assessments of your osteoporosis risk

because these are the locations where major fractures tend to occur — fractures that can severely limit the quality and even the length of your life.

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## BMD Test Results

- Your bone density test results are reported in two numbers: T-scores and Z-scores.

## BMD Test Results

- **T-score**

Your T-score is your bone density compared with what is normally expected in a healthy young adult of your sex. Your T-score is the number of units — standard deviations (SD) — that your bone density is above or below the standard

T-score	What your score means
Above -1	Your bone density is considered normal.
Between -1 and -2.5	Your score is a sign of osteopenia, a condition in which bone density is below normal and may lead to osteoporosis.
Below -2.5	Your bone density indicates you have osteoporosis.

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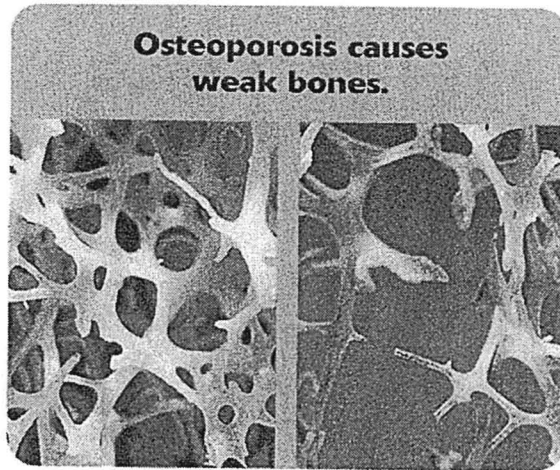
## Z-Score

- The number of standard deviations above or below what's normally expected
- This is helpful because it may suggest you have a secondary form of osteoporosis through which something other than aging is causing abnormal bone loss.
- A Z-score less than -1.5 might indicate these other factors are to blame.

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Your Z-score is the number of standard deviations above or below what's normally expected for someone of your age, sex, weight, and ethnic or racial origin. This is helpful because it may suggest you have a secondary form of osteoporosis through which something other than aging is causing abnormal bone loss. A Z-score less than -1.5 might indicate these other factors are to blame. Your doctor would then try to determine if there's any underlying cause for the low bone mass. If he or she can identify a cause, that condition can often be treated and the bone loss slowed or stopped.

## Normal vs. Osteoporotic Bone



Normal  
Bone

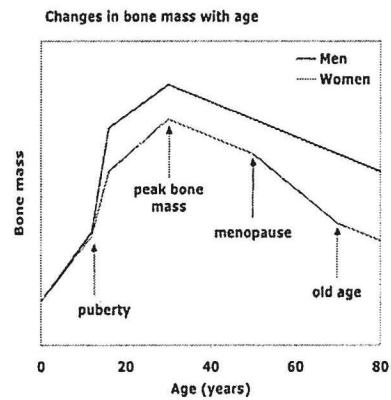
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Bone with  
Osteoporosis



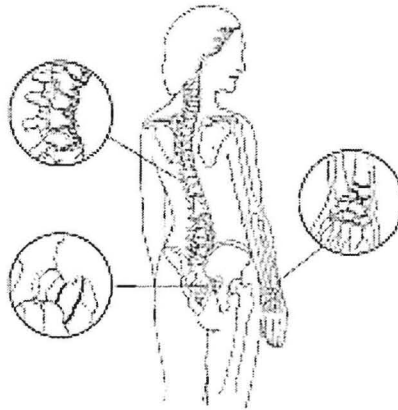
# Peak Bone Mass

- 60-70% variation due to genetics
- 30-40%
  - Environmental factors during fetal life
  - Diet
  - Physical activity



# Compression Fractures

- Hip
- Spine
- Wrist



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With Osteoporosis there is increased risk for compression fractures. If one sustains a compression fracture of the spine, the most common type of compression fracture is called a wedge fracture in which the anterior (front) aspect of the vertebrae collapses. If compression fractures occur in several bordering vertebrae, a forward head and forward shoulder posture begins (kyphosis). Kyphosis can lead to Dowager's hump and increased curve of the lumbar spine. BMD test completed during pre-transplant evaluation, 4 month post-op evaluation and annually thereafter. Photograph: "By permission of Mayo Foundation for Medical Education and Research. All rights reserved." April 10, 2008

## Boning up on Osteoporosis

- Osteoporosis is also known as the *SILENT DISEASE*
- You can not feel your bone becoming weaker
- Bone loss occurs slowly over time

## Group Activity

- BMD
- Group Discussion
- View patients X-Rays

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- 1) Provide patients with their individual BMD Test Results
- 2) View group members Bone scans (ones with compression fractures)
- 3) Have each person identify 2 habitual tasks that could be changed using the principles learned today.

## Areas of Education

- Joint Protection/Body Mechanics
- Postural Awareness
- Energy Conservation

## Recommended Calcium Intakes

- 1000-1500mg/daily
- Can only absorb 500 mg of  $\text{Ca}^{+}$  at a time
- Consult MD re: possible interactions with prescription meds
- $\text{Ca}^{+}$  ↓ absorption of iron and antibiotic tetracycline
- Choose supplement labeled "Purified" or with USP symbol of purity

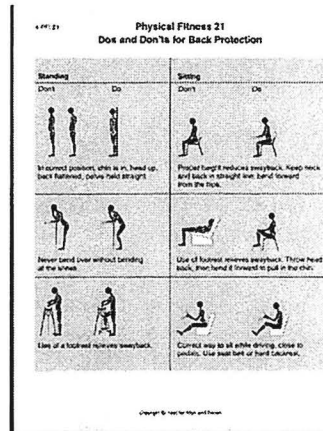
GlaxoSmithKline

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If taking more than 500 mg of Ca, take them at different time intervals

# Back Protection

- Stress management & Relaxation
- Exercise & weight management
- Good Posture
- Practicing proper body mechanics



# Osteoporosis & Exercise

- Weight-Bearing Exercises
  - High Impact
  - Low Impact
  - Non-Impact

National Osteoporosis Foundation



## High Impact Exercises

- Stair Climbing
- Hiking
- Dancing
- Jogging
- Volleyball
- Basketball
- Downhill & Cross-Country Skiing
- Aerobic Dancing
- Gymnastics
- Weight Lifting
- Resistance Training

## Low Impact Exercises

- Walking
- Treadmill Walking
- Cross Country Ski Machines
- Stair Stepping Machines
- Rowing Machines
- Water Aerobics
- Deep-Water Walking
- Low Impact Aerobics

## Non-Impact Exercises

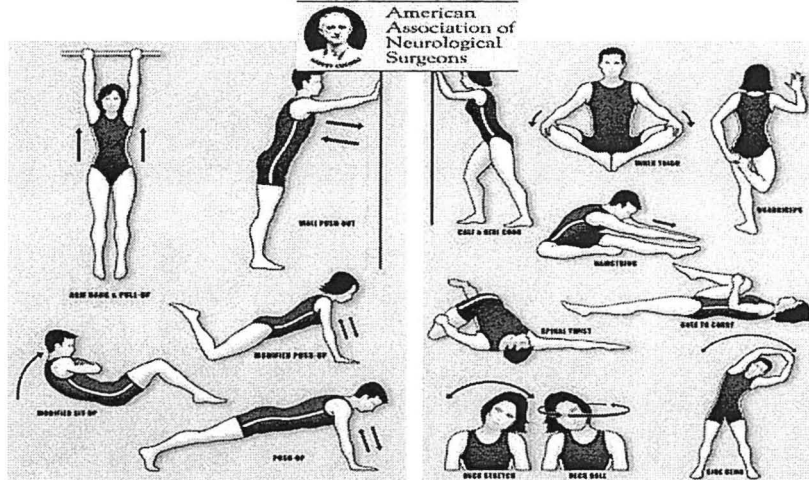
- Lap Swimming
- Indoor Cycling
- Stretching
- Flexibility Exercises  
(avoid forward bending exercises)

# Body Mechanics

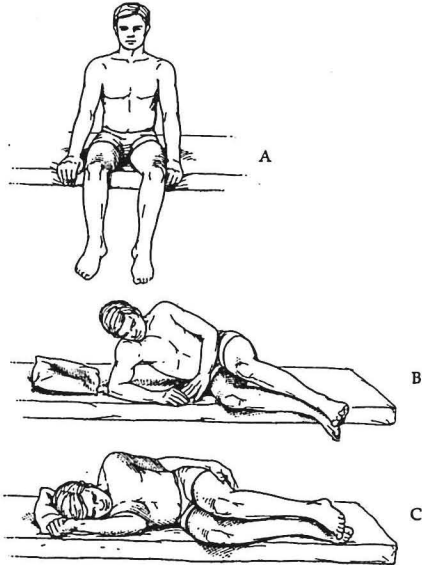
- Log Rolling Technique
- Lifting Technique
- Movement Patterns
  - Avoid twisting or jerking movements



# Back Strengthening Exercises



# Bed Mobility Log Roll Technique



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Photograph: "By permission of Mayo Foundation for Medical Education and Research. All rights reserved." April 10, 2008

# Postural Awareness



Figure 7



Figure 8



Figure 9

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Neutral spine

Sitting – Standing – Lying

Photograph: "By permission of Mayo Foundation for Medical Education and Research. All rights reserved." April 10, 2008



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Review remaining schedule



## APPENDIX E

### LIVING WITH END-STAGE LIVER DISEASE SESSION 4

Title of Presentation: Living With End-Stage Liver Disease: Session 4  
“An Exercise Session”

Intended Audience: Patients and family/caregivers whom are awaiting liver transplantation.  
Must have completed sessions 1,2 & 3.

Learning Objectives:

- 1) The participant will describe the importance of exercise.
- 2) The participant will demonstrate specific stretches for pre and post liver transplant exercises.
- 3) The participant will participate in establishing appropriate individualized walking program.

Agenda:

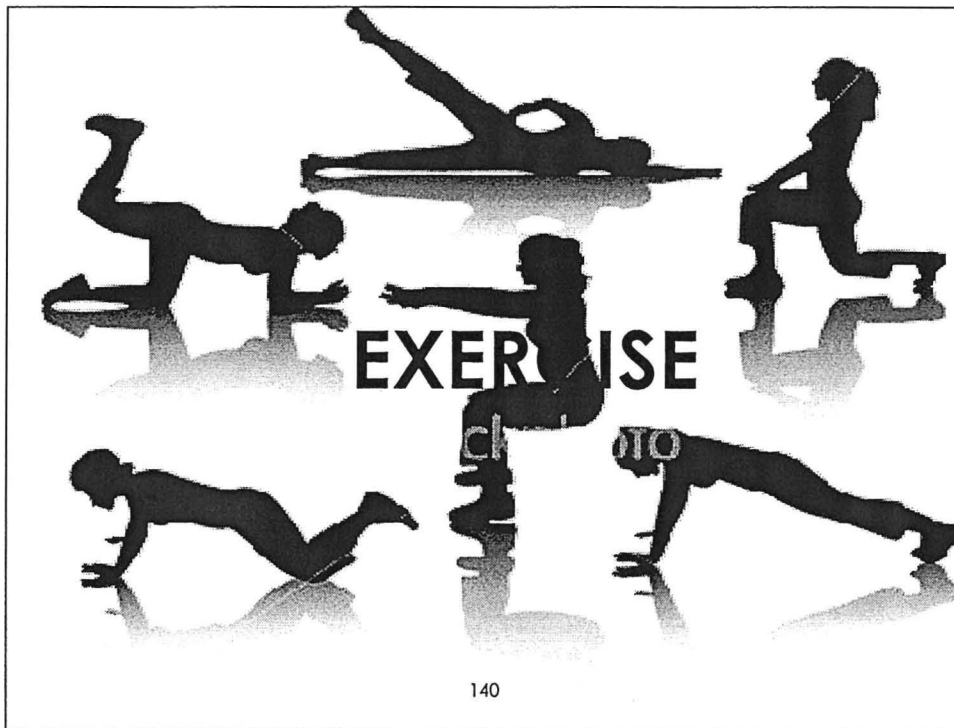
- Importance of Exercise
- Review of Perceived Exertion Scale
- Instruction in pre and post exercise stretches (group exercise participation)
- Importance of Walking Program
- Group instruction & participation in upper extremity exercises
- Question/Answers

Teaching Materials:

- 1) Power Point Presentation
- 2) Handouts of power point presentation with space for writing notes
- 3) Exercise Programs
- 4) Large room to spread out for exercise session
- 5) Dowel rods (variety of weighted/non weighted ones)
- 6) Miscellaneous cuff weights to add resistance for wand exercises
  - a. Yellow, Red & Green Theraband

# Living With End-Stage Liver Disease

## Session 4



**Physical exercise** is bodily activity that develops or maintains physical fitness and overall health

Frequent and regular physical exercise boosts the immune system also improves mental health and helps prevent depression.

Physical exercise is important for maintaining physical fitness and can contribute positively to maintaining healthy

weight, building and maintaining healthy bone density, muscle strength, and joint mobility, promoting

physiological well-being, reducing surgical risks, and strengthening the immune system.

Exercise aids a person to obtain habits and lifestyle change to maintain a healthy lifestyle.

## Exercise & Stretching

- It is important that you remain as active as possible prior to and after your transplant. Developing and following a regular aerobic program will:

## Exercise & Stretching

- Increase stamina & endurance
- Help maintain healthy heart & lungs
- Help maintain healthy bones
- Tone your muscles
- Help to reduce stress & tension
- Improve your self image
- Help with weight control
- Help to control blood pressure

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Increase stamina & endurance & energy which will help you have muscular and cardiovascular strength prior to and may help you recover more quickly after your hospital stay.

"The stronger you are going into surgery, the easier the recovery process"  
Help to reduce stress & tension which can help you relax and sleep better

## General Aerobic Exercise Principles

- It takes 2 to 3 weeks to begin to improve your fitness level
- It takes 6 weeks to 3 months to achieve significant improvement
- It takes 3 to 6 months for your max fitness to be achieved
- In only two days of inactivity, you start to lose endurance
- Much of the benefit will be lost within two weeks if you do not exercise during that time period

## Duration of Activity

- Optimal duration of conditioning phase is 20 minutes
- It is acceptable to break up the 20-min goal into increments of 5 minutes of activity/exercise throughout the day
- For beginners, gradually increase your activity

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Patients awaiting liver transplantation may have activity levels that vary from bed-ridden to full-time employment.

For some, exercise is getting out of bed to go to the bathroom and return to bed, for others, walking/running is exercise.

Exercises can be completed at all levels of function.

# Perceived Exertion Scale

Rate of Perceived Exertion		
Least effort		
6		
7	very, very light	
8		
9	very light	
10		
11	fairly light	Endurance Training zone
12		
13	somewhat hard	
14		
15	hard	Strength Training zone
16		
17	very hard	
18		
19	very, very hard	
20		
Maximum effort		

The Lifegevity Institute

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Target Range for ESLD is 11-14

Taking your pulse is not always an accurate measure of the intensity of your exercise/activity.

This is due to the effect certain medications can have on the heart rate (either raising or lowering heart rate).

We recommend that you use the perceived exertion scale. The scale takes into account for all sensation of exertion, physical stress and fatigue.

When using the rating scale, do not try to focus on any one thing such as leg discomfort or labored breathing, instead try to concentrate on your total body feeling.



# Stretches

- When standing, avoid forward bending at your waist
- Perform before & after exercise

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Stretches are a vital part of an exercise program.

Avoid forward bending stretches and exercises including touching your toes and sit-ups.

Lower extremity and exercise programs are an important part of our strength pre and post transplant.

All participants will complete therapist guided stretching program.

## Walking Program

- Wear comfortable clothing and shoes.
- Do not perform your exercise and walking program for at least one hour after meals.
- Avoid hilly areas and excessive stair climbing. Pace yourself when climbing stairs.
- Exercising in cold and windy or hot and humid weather puts stress on your heart. If temperatures outside are below 40 degrees or above 75 degrees, then exercise indoors at home or at a shopping mall.
- Riding a stationary bike or walking on a treadmill is an acceptable alternative to walking.

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Low impact, weight bearing exercise that builds bone strength.

Nearly every recommendation for how to improve your health includes a suggestion for at least 30 minutes

of aerobic exercise a day, on most days of the week. Walking is one of the easiest and most common

activities that you can add to your daily routine.

It requires very little preparation other than good shoes and a desire to succeed, and can be done anytime,

anywhere - without special equipment or facilities. Walking doesn't need to interfere with work demands

and can even be incorporated into a normal workday, if desired, by adding a walk to your lunch hour.

Individuals who make walking a part of their everyday activities will feel better mentally, physically, and

emotionally, and be more productive as a result. Regular physical activity, such as walking, may decrease

your risk for chronic and/or critical illnesses, such as heart disease, diabetes, and some forms of cancer.

It can also increase immunity to common communicable diseases to which we are exposed daily, such

as colds and other viruses.

## Strengthening & Endurance Exercises

- Wand Exercises
- Theraband Exercises

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Can be modified for sitting, lying and standing

# Exercise

- Get Ready to exercise...

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All participants will perform UE arm exercise as group

Therapist will select appropriate device: dowel or Theraband and perform each exercise

# QUESTIONS?

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Review schedule of remaining sessions

## APPENDIX F

### LIVING WITH END-STAGE LIVER DISEASE SESSION 5

Title of Presentation: Living With End-Stage Liver Disease: Session 5  
“Post Surgical Activity Guidelines”

Intended Audience: Patients and family/caregivers whom are awaiting liver transplantation.  
Must have completed sessions 1,2, 3 & 4.

Learning Objectives:

- 1) The participant will identify symptoms of organ rejection post transplant.
- 2) The participant will learn strategies for preventing infection.
- 3) The participant will verbalize good understanding post liver transplant activity expectations.
- 4) The participant will verbalize good understanding of occupational therapy discharge criteria necessary prior to discharge home.

Agenda:

Education on medical team members involved in patient care for liver transplantations.

Symptoms & management of organ rejection.

Infection and prevention education.

Patient responsibilities following liver transplantation.

Occupational therapy interventions post liver transplant.

Post transplant guidelines.

Occupational therapy discharge criteria.

Questions/Answers.

Teaching Materials:

- 1) Power Point Presentation
- 2) Handouts of power point presentation with space for writing notes

# Living With End-Stage Liver Disease

"Post Liver Transplant Guidelines"  
Session 5



## Team Approach

- Patient
- Support System
- Transplant Surgeons & Hepatologists
- Transplant Physician Assistants
- Transplant Nurse Coordinators
- Transplant Social Workers
- Psychiatrist
- Dietitian
- Transplant Pharmacist
- Clinical Nurse Specialist
- Transplant ICU & Unit Nurses
- Transplant Anesthesiologist/Surgical Team
- Occupational Therapist
- Physical Therapist
- Transplant Financial Counselors



## 2 Most Common Post-Transplant Problems

- Rejection
- Infection

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Roles of the Immune System: Friend or Foe?

Friends of the Immune System—all tissues and organs that were present at birth

Foes of the Immune System: Bacteria, viruses, fungi, Foreign tissue and organs, Cancer cells

Weapons of the Immune System : Cells:

White blood cells & Natural Killer cells, Tissue and organs, Spleen and lymph nodes

Skin and mucous membranes, Proteins, Stomach acid,

Duties: "Search & destroy the enemy"

What Happens in Rejection? "Weapons" of the Immune System recognize the transplanted organ as a "foe"

Cells and tissues act to try to destroy the organ. As the transplanted organ is attacked, some of the cells of the organ break open and die. The dying cells release "enzymes" or chemicals that are measured in the blood. These blood tests help the team know that damage is occurring.

Acute Rejection: Facts

Common; approximately 70% of patients have 1 rejection episode, Does not equal liver failure, Is usually easily treated, if detected early.

Acute Rejection: Facts

Detection                      May or may not have symptoms, Usually found on routine labs

Rejection: Facts

Repeated episodes lead to more and more cell damage

Cell damage eventually leads to scar tissue ("fibrosis")

Scar tissue does not have the ability to function normally

Organ function decreases as the fibrosis worsens and cirrhosis develops

Usually requires a liver biopsy for final diagnosis, With Rejection comes decline in functional performance.

## Possible Symptoms of Rejection

- Fatigue
- Weakness
- Fever
- Abdominal pain or tenderness
- Dark yellow or orange urine
- Clay-colored (light) stools
- Most likely: NO SYMPTOMS EXCEPT ABNORMAL LIVER TESTS!

## How to Prevent Rejection

- Get labs as ordered
- Take medications exactly as prescribed
- Never run out of medications
- Inform transplant coordinator of symptoms
- Keep all medical appointments
- Ask questions
- Maintain a healthy life style

## How Is Your New Liver Protected from The Immune System?

- Medications
  - Interfere with Immune System's abilities to recognize and/or destroy "foes"
  - Not specific to the transplanted organ
  - Cause a weakness in the defense against bacteria, viruses, and fungi=  
Increased risk of infection

# Infection

- Anti-rejection drugs



- Decrease ability to fight infection
- Increase susceptibility to development of a new infection or to reactivation of a previous infection



## Recognizing Infection



- Fatigue
- Fever
- Weakness
- Body aches
- Blisters or skin rash
- Cough
- Green or yellow mucus or sputum
- Chills
- Foul smelling or looking drainage
- White spots on tongue
- Vomiting
- Diarrhea
- Visual problems
- Headache

# Infection Prevention



- Avoidance of infection risks
- Practice of infection control

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Request that all visitors whom are feeling ill refrain from visiting  
Practice Good Hand Hygiene

# Infection Prevention



- Wash hands frequently with antibacterial soap
- Do not work in soil for 6 months; after this time, wear mask and gloves
- Do not handle animal excreta
- Avoid contact with sick people
- Avoid contact with people who have received live vaccines
- Do not eat from salad bars for 6 months

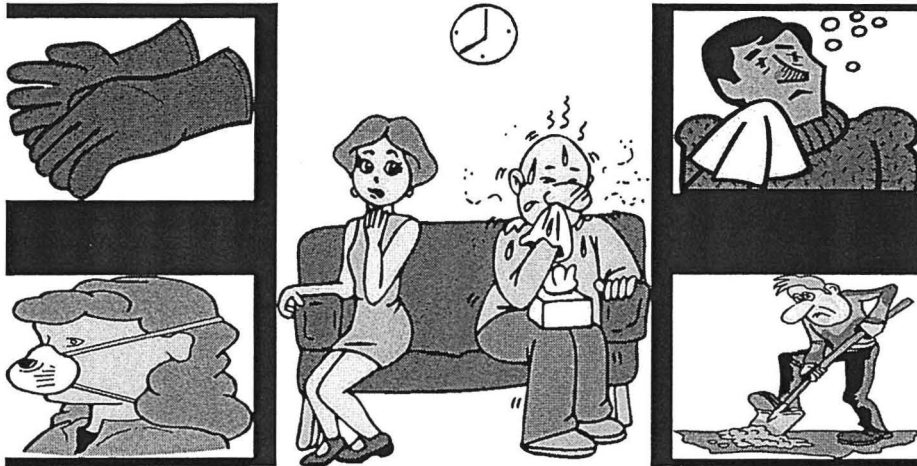




## Infection Prevention

- Do not share eating utensils and personal items
- Do not work in or clean extremely dusty environments
- Wash all fruits and vegetables thoroughly
- Cook all meat and seafood
- Do not renovate your home in first 6 months after transplant
- Do not drink well, stream, lake, or river water

# Infection Prevention



# Patient Responsibilities

- Maintains long-term health commitment
  - Demonstrates self-reliance regarding labs and medical follow up
  - Takes responsibility for medication and health care needs (GYN, dental, PCP)
  - Knows medications; maintains health history
  - Abstains from use of alcohol, tobacco, illegal drugs
- Displays mutual respect
- Provides timely and accurate information to team

## Keys for Staying Healthy After Liver Transplant

- First 4 months after transplant (Protocol)
  - Expect to remain in metro Phoenix area for at least 4 weeks after hospital discharge
  - Labs and office visits twice a week for 4 weeks
  - Labs every week for following 3 months
  - 3 or 4 month post-transplant evaluation
  - Continue with recommended tasks provided by your OT/PT
  - Follow-up will be individualized according to patient's medical needs

## After Liver Transplant

- 4 months to 1 year after transplant (Protocol)
  - Labs every 2 weeks until 1 year post-transplant
  - Telephone communication with coordinator
  - Compliance with medical treatment plan
  - Annual post-transplant evaluation

# Occupational Therapy Following Liver Transplant

- Post-op Day 1 (day after surgery, in ICU)
- Post-op Day 2 (patient often transferred to medical/surgical floor)
- Post-op Day 3-7

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Occupational Therapy is a health and rehabilitation profession that helps people regain, develop, and build skills that are important for independent functioning, health, well being, security and happiness.

OT practitioners work with people of all ages who, because of illness, injury, or developmental or psychological impairment, need specialized assistance in learning skills to enable them to lead independent, productive, and satisfying lives. (The American Occupational Therapy Association)

POD 1: No therapy intervention

POD 2: OT orders to evaluate and Treat

- ROM is started
- Out of bed to chair and begin ADL re-training – functional activity, etc.
- Check on patient's bone mineral density and record on patient information card.

Instruct in Log roll technique, and back care principles and abdominal incisional limitations

Patients can not lift anything over 10 pounds (gallon of milk or phone book)!!! For 4 Weeks

POD 2: continue to progress pt as tolerated.

instruct patient to use perceived exertion scale, energy conservation, back care principles, posture

Instruct in safety with bathroom transfers and Continue with ADL re-training.

- equipment needs as appropriate
- Most often, patients may shower on post-op day 2, need to put saran wrap over the incision when patient showers saran wrap over existing medical lines (not abdominal incision)
- Begin patient/caregiver education

Patients can not lift anything over 10 pounds (gallon of milk and phone book)!!!

**Post-op Day 3-7 :** Continue with therapy progression: Instruct in recommend UE mild resistive HEP (nothing more resistive than green T-band due to lifting restrictions and encourage walking program

Average Length of Stay is 5-7 days.

Goal is d/c as soon as medically possible due to increased risk for infections

## Week 1 post OLT

- Log roll
- ADL & IADL Re-training
- Lifting restrictions of 10 pounds
- Mild resistive exercises
- Walking Program

## OT D/C Criteria

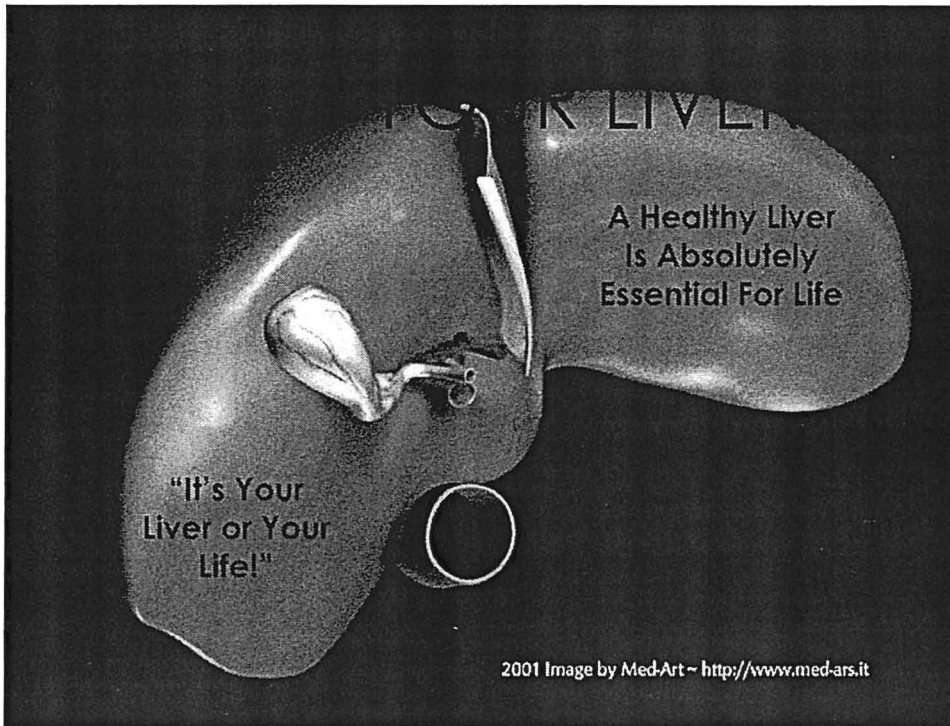
- Demo indep with log roll
- Supvsn with basic self care tasks
- Supvsn with toilet & shower transfers
- Good safety
- Good understanding necessary DME/AE
- Follow through with Energy Conservation
- Established walking program
- Indep with dispensing of Medications
- Good awareness post infection prevention
- Good follow through with lifting restrictions

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Get in/out of bed indep

Encourage normal movement: No abdominal exercises, however LB dressing should occur due to shortened muscles and skin if avoidance due to incision.





Questions?



## APPENDIX G

### NARRATIVE RATIONALE

Teaching Methods: Bastable (2006) defines learning as the process by which individuals gain new knowledge and skills or change their attitudes and behaviors. Teaching methods utilized in this educational series include lecture, group discussion, demonstration and return demonstration. The cognitive learning theory is the primary approach in instruction, however the social learning approach is intertwined.

This lecture is done via power-point presentation format with the main items highlighted and the speaker providing additional information for the audience to make note of. This lecture utilizes the cognitive theory approach to learning. Use of lecturing can reinforce learning through a process of retrieving existing knowledge and presentation of new information. The instructor enables the learner to independently organize the information that is important to them and how/when to utilize it.

Group discussion & activity is utilized to facilitate clinical application of the recently learned information via participants personal experiences. This teaching method facilitates learning amongst peers as the learners discuss opinions and personal reactions regarding the information instructed. Group discussion can be taught in both the cognitive and social learning theories. In this group of learners, all participants are affected by end stage liver disease and have established common ground for learning as in the cognitive theoretical approach. Group discussion occurs within a social context therefore the social learning approach is emphasized.

Demonstration and return demonstration is the final teaching approach utilized during the educational sessions. The instructor provides the background and foundation intervention techniques and then instructs and demonstrates the techniques to best achieve the patient outcomes set forth. Lab time is available to observe demonstration of exercises and return demonstration of the treatment interventions necessary to promote positive outcomes. A social learning approach is emphasized during this teaching method and cognitive principles are applied in that the individuals are practicing self-regulation and control of what he/she is learning. During social learning, people learn from one another, encompassing such concepts as observational learning, imitation, and modeling. Bastable (2006) reports that role modeling demonstrates behavior, which is perceived by the learner as reinforced and could facilitate and or inhibit learning. With social learning, people can learn by observing the behaviors of others and the outcomes of those behaviors, learning can occur without a change in behavior and the consequences of behavior play a role in learning. Social learning theory believes that learning occurs largely through modeling without environmental influence. The cognitive learning theory (Bastable, 2006) was utilized in order for the learners to be able to incorporate their own perceptions, thoughts, and memories from their own experiences in order to enhance the materials being learned in the educational session.

Principles of adult learning: Malcom Knowles describes adult learners as autonomous and self-directed and who have accumulated a foundation of life experiences and knowledge, are goal-oriented and relevancy-oriented and practical.

Principles of education were applied in this educational series by incorporating the four critical elements of learning that must be addressed to ensure that participants learn. These elements are motivation, reinforcement, retention and transference.

*Motivation:* The participant demonstrates interest in the topic by electing to attend. He/She will personally benefit from the learning experience and are self-motivated to learn. The degree of difficulty was set high enough to challenge the participants about the topic without overloading them.

*Reinforcement:* Reinforcement was a part of the teaching-learning process to ensure a positive learning experience. Through lab activities, discussion, questions/answer session, the instructor was able to assess if learning is occurring and help the participants retain what they have learned.

*Retention:* Retention by the participants is directly affected by their amount of practice during the learning. After the participants observe and demonstrate correct intervention techniques they will be encouraged to participate more often in the treatment of persons with end stage liver disease.

*Transference:* The information in this workshop provided the participants with the training and education to use the information taught in the education's instruction in their work setting. Through the instruction of series, the instructor was able to show the participants that the course will benefit them pragmatically and provided them with tools to improve occupational performance while living with end-stage liver disease.

## APPENDIX H

### PERMISSION FOR ILLUSTRATIONS

**From:** Perry, Rosemary  
**Sent:** Thursday, April 10, 2008 12:38 PM  
**To:** Sauber, Tina M.  
**Subject:** RE: photos

Dear Ms. Sauber,

Permission is granted to you to reuse the illustrations enclosed in your forthcoming "scholarly project" for graduate school.

The copyright for this material is held by Mayo Foundation. Therefore the byline should read, "By permission of Mayo Foundation for Medical Education and Research. All rights reserved."

Rosemary Perry  
Agent, Mayo Foundation  
April 10, 2008

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**From:** Sauber, Tina M.  
**Sent:** Wednesday, April 09, 2008 12:14 PM  
**To:** Perry, Rosemary  
**Subject:** FW: photos

Hi Rosemary,  
I spoke with you yesterday regarding seeking approval from Mayo Clinic to use the enclosed photos in my scholarly project for graduate school. The project is an "unpublished" document that will be kept on file at the University Library. The photos are placed in a power point presentation format.

The positioning photos are from the Pre-Liver Transplant Patient Education material MC0906 and the other photos are from the Mayo Clinic consumers website.

I hope you can make them out, I copied them to a word document.  
I really appreciate your advice regarding this,

Tina M. Sauber, OTR/L  
Team Lead, Occupational Therapy  
Clinical Coordinator for Continuing Education  
Vestibular & Balance Therapy  
Mayo Clinic Hospital, Arizona  
Phone: 480-342-2075  
Pager 127-9290

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